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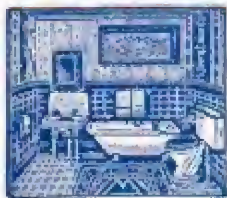
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POPULAR MECHANICS MAGAZINE

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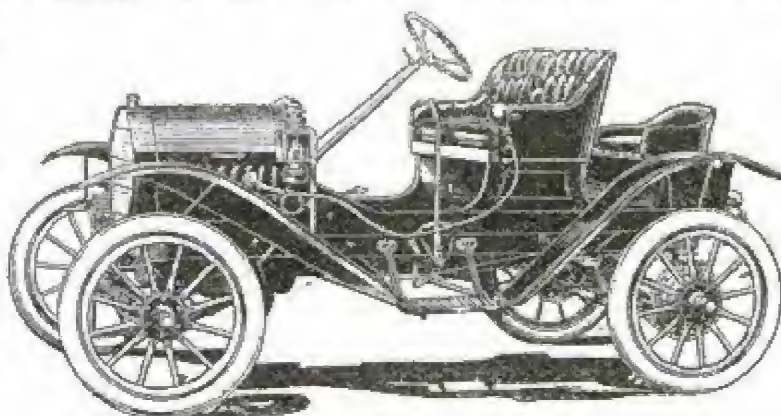
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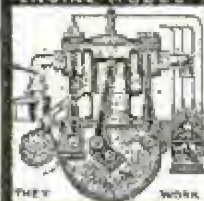
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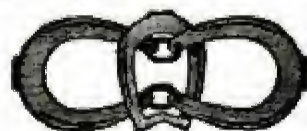
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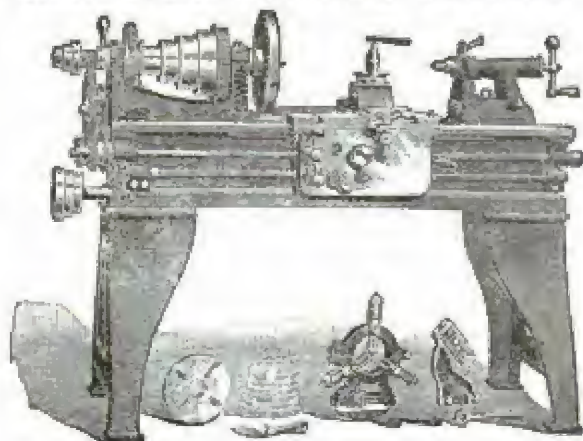
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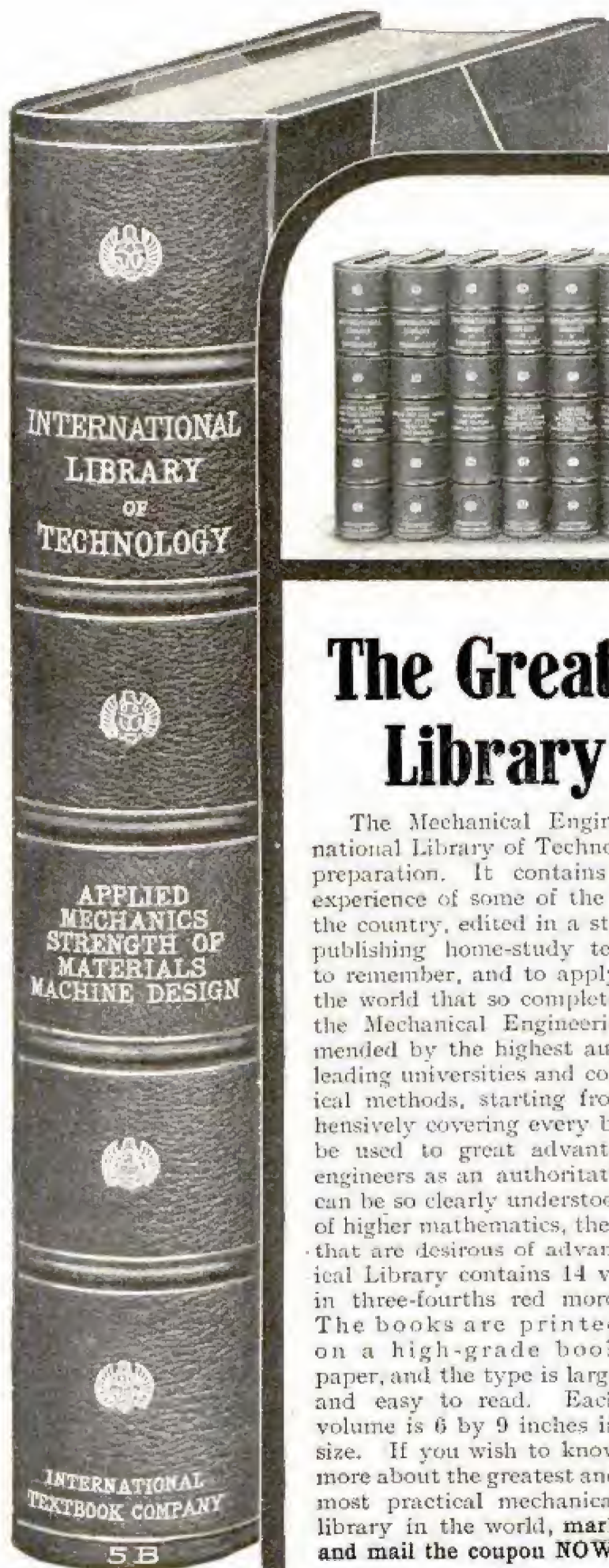
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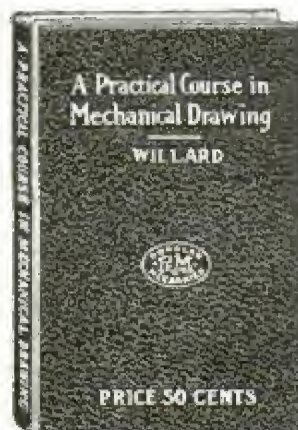
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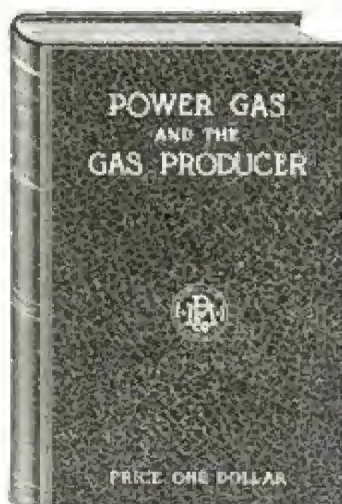
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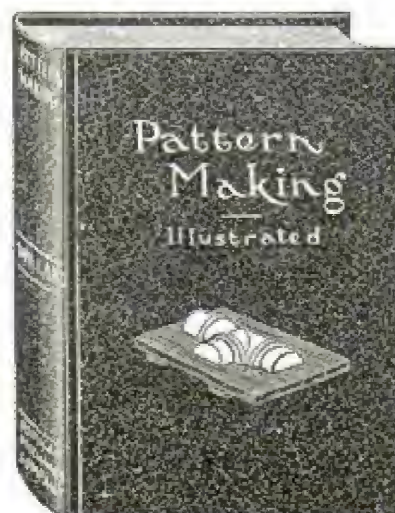
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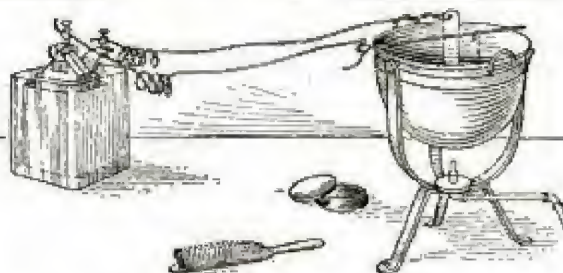
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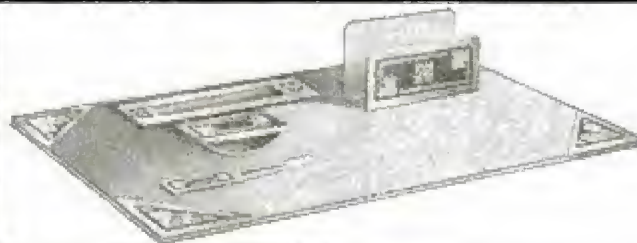
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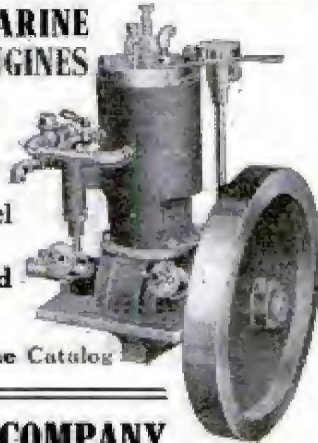
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TRICKS, MAGICAL APPARATUS AND SUPPLIES—Amateurs supplied as well as the great professionals. Easy, interesting and entertaining, amuse and astonish your friends. 4c stamps brings our four catalogues: Magical Apparatus, Latest Supplement, Marvelous Card Effects and Trick Novelties and Jokers. Send now. Read & Covert, 817C East 43d St., Chicago, Ill.

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LATEST JOKERS' NOVELTIES, right off the griddle; a red hot one postpaid 12 cents, with illustrations; fifty others. Genesee Specialty Co., Dept. P.M. Reiss, N. Y.

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KEEP COOL! for sale, 200 new 8" A. C. & D. C. bracket fans, complete with cord and attachment plug, \$6.50 each. Noiseless, for telephone booths, residences, hospitals or sick rooms. Order at once as they are going fast. Money refunded if not satisfactory. Electrical Supply & Salvage Co., 529 W. Van Buren St., Chicago.

FORTY PER CENT DISCOUNT on new disc and cylinder talking machines and records to close out stock. Make money selling your friends. Particulars free. Box 965, Ashland, Ohio.

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FOR SALE a quantity of light sleigh runner steel, also some high grade bodies. For particulars write to John G. Rathel, Little Falls, N. Y.

FOR SALE: Motor cycle engine, Wireless instruments, Lewis Barrell, 38 Pear St., Zanesville, Ohio.

FOR SALE—Indian Motor cycle, 11 x 17 printing press, Twelve inch screw cutting lathe. Geo. Willis, Canal Dover, Ohio.

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FOR SALE. Wheatstone Bridge, reflecting galvanometer, pocket telegraph instrument. C. J. Conner, Coatesville, Pa.

FOR SALE—Moving picture film 1c foot. H. Davis, Watertown, Wis.

"TEXTIGEM" TYPEWRITER COVERS, blue, 50c. See what I say under "Typewriters." Aichison.

REAL BARGAINS, MOTOR CYCLES, BICYCLES, marine and stationary engines, furniture, musical instruments, pianos, typewriters, sewing machines, etc. Agents wanted. Make a whole lot of money getting orders for us. Write for booklet. Atlantic Supply Co., Long Branch, N. J.

SANDWICH JUNIOR RAY PRESS, complete with gas engine or without. Nearly new. Terms. Nell, Lebanon, N. Y.

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MUSHROOMS—NEW PURE TISSUE culture summer spawn. Now is the time, plant this new spawn; produces big crop white mushrooms all summer. Four other varieties winter planting; modern plan forcing plants, mushrooms, early quick crop. Book free. Fresh sample brick, 35c postpaid. We are originators and manufacturers of pure tissue culture mushroom spawn. Order direct from laboratory. Challenge Farm, 6961 Gravelly Ave., St. Louis, Mo.

BUSINESS OPPORTUNITY—\$200.00 to \$400.00 a month profit can be made by you with our machines. You are your own boss and get the monopoly. Only one in each locality. You must invest from \$100.00 to \$300.00. If you are not satisfied after month's trial, just return outfit and we send your money back. We are responsible and furnish Dun, Bradstreet and bank reference. Full plans free. Address Fred Hoke, 1644 Van Buren Street, Indianapolis, Ind.

BIG MONEY in automatic musical instruments. To close out we offer electric player pianos, pianinos, harps, less than half price. Pay for themselves in few months in public places. Box 965, Ashtabula, Ohio.

WANTED—SCHOOL BOARDS, SUPERINTENDENTS and dealers in school apparatus, to take interest in patented novelty; practical help for schools, homes, libraries. For descriptive circulars, address: C. A. Iffert, Monroe, Wis.

MAKE MIRRORS AT HOME. Big profits with little outlay. One 18x36-in. mirror costs \$2 to \$5. You can silver a glass this size for 20c. Send \$1 in stamps or money order and we will send you explicit directions how to do it; also how to emboss, grind, foil, gold leaf, frost, chip and make imitation stained glass. How to transfer photos on glass, bore holes in glass and cut skylights. George L. Patterson & Co., Dept. 3, Brooksville, Ky.

BUILD A BUSINESS of your own and escape salaried drudgery for life. Learn the Collection Business. Limitless field; little competition. Few opportunities so profitable. Send for "Pointers" today. American Collection Service, 101 State St., Detroit, Mich.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

LEARN THE TRUTH about Mail Order Business before buying "outfits." Important information and particulars for starting free. Mail Order Library, P. M. Tompkinsville, New York City.

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QUIT HARD WORK and impossible proportional! Operate a "Silent Salesman" system; possibilities up to \$100 weekly. Also Mail Business, evenings, \$28 weekly. Get away from wage slavery. "Booster" starts you in business for yourself with small investment. Send 10c for two months trial. Booster Magazine, 208 N. Fifth, Chicago.

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MAKE \$50.00 WEEKLY in Mercantile Collection Business; capital and experience unnecessary; start during spare time and become independent; particulars free. E. W. Briggs Co., Washington, D. C.

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INDEPENDENCE and fortune quickly attained in the Manufacturing Mail Order Business. I furnish formulas, manufacturing processes and trade secrets in all lines. Sold under a positive guarantee; 18 years' practical experience. Revision and improvement of formulas and processes; reduction of manufacturing cost; utilization of waste materials, etc., a specialty. Booklet, formula list and valuable information free. W. L. Cummings, Ph. D., 127 Standard St., Syracuse, N. Y.

BOYS, REAL MONEY can be made by our plan. You get the money, we do the work. Nothing to sell. Automatic Co., Box 616, Omaha, Neb.

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START A NEW BUSINESS. The "American" Razor Honing and Safety Blade Sharpening Machine earns \$5 to \$10 a day. We teach you how. No previous experience required. R. Green, 171 Washington St., Chicago.

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MONEY MAKER—See my ad under machinery—Neil.

FORTUNES MADE MAILING CIRCULARS. Plan and 25c, sample 12c. Popular Institute, 56 Randolph, Chicago.

SELL ANYTHING. Quick results, all classes, read The Buyers' Guide. Send 5c for copy and rates, 50c a year, 219 So. Dearborn St., Chicago.

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INCREASE YOUR INCOME. Be independent. Our book contains a valuable collection of formulas, plans, schemes; how to make good money during your sparetime. Send 15—2c stamps now and turn your sparetime into cash. Albany Supply House, 4322 N. Albany Ave., Chicago.

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50% PARTICIPATING STOCK IN NOISELESS TYPEWRITER. Big firms using it. Anderson Shorthand Typewriter, 5714 Cedar Avenue, Philadelphia, Pa.

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BAKERY, including building, nice store, fixtures, electric mixer, good oven, good retail and wholesale trade, in growing manufacturing town of 6,000; only bakery in town; best proposition between St. Louis and Memphis; good reason for selling; bargain. J. H. Fisher, 305 Main St., Highville, Ark.

RAISE GINSENG—\$1 per square foot of ground. \$25,000 on ¼ A. Grows anywhere; ½ city lot a bonanza. 10c brings booklet. Sheboygan Ginseng Gardens, Sheboygan, Wis.

COMPLETE INSTRUCTIONS FOR RESILVERING TABLEWARE. Simple, sure, lasting method; for home or commercial use. Only fifty cents. F. P. Daniels, Minneapolis, Minn.

ONE BLACKSMITH OR MACHINIST in each town can double his income by welding cast iron, aluminum and other metals. Our system is the best and prices right, and we school you in the work. J. R. Luckey, Norwood, Cincinnati, Ohio.

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HAVE YOU ANYTHING TO ADVERTISE? Our Rate Book tells you all about advertising mediums, rates, circulation, closing dates, etc. Sent for 10c. Worth dollars. Folder free. Correspondence invited. Dearborn Advertising Agency, 455 Franklin Bldg., Chicago.

FORM A CORPORATION—Congress Law for D. C. and all States; cheap. Raise money easily; advice free. U. S. Legal Corporation, Washington, D. C. Representing \$1,225,000,000.

3c A WORD places "ads" in over 100 reputable magazines. Zenith Agency, Station N, Cincinnati, Ohio.

CONDUCT A "CANDY KITCHEN." Clear \$20 daily. Small capital required. Send for particulars. Kennon & Co., 148 West Ontario St., Dept. A, Chicago.

I MADE \$50,000 in five years with a small mail order business; began with \$5. Send for free booklet. Tells how. Heacock, Lockport, N. Y.

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FOR RENT—BRICK FACTORY building in Sterling, Ill., fine location. Joseph Wright, Sterling, Ill. Room 5 H. & W. Bldg.

I HAVE AN ARTICLE to manufacture at home that beats them all. Particulars free. P. Benson, Stewartville, Minn.

YOU CAN MAKE PRINTING CUTS—Any size, for 2c each! Explicit, complete instructions, 25c, prepaid. "Gearhart," Box 12, Fresno, California.

TURN YOUR SPARE TIME into money with our live, up-to-the minute mail order plan; \$5 capital will start. Circulars with your imprint furnished. Profitable for man or woman. Particulars free. Stark Co., Whiting, Ind.

POSITIVELY BEST RIBBONS, three, \$1.10. See what I say under "Typewriters." Atchison.

AGENTS WANTED

WEAR A STYLISH SUIT! Clothes Make the Man! The man who is admired is the well dressed man whose clothes are fashionable and are 1911 styles. You will be that man in your neighborhood! 1911 styles are just in. Get this suit—the swiftest, classiest, snappiest style we ever created—and better your appearance! This is our idea: We want one man as our representative in your neighborhood. You've got a lot of friends. They wear clothes. It is the easiest thing in the world to get them to order their clothes from you. Prices, \$7.50 and up. Those orders mean a big business that more than doubles your salary, and the work is the easiest, cleanest, nicest occupation in the world. New representatives make \$5 to \$10 a day. You simply take the order and measurements and mail them to us. We make the clothes, ship them on approval to your friend and hand you the profit money. A regular clinic! That's the beauty of being in business for yourself. Sit right down now; write us a postal or a letter for the free outfit to representatives. And you get the swiftest suit of fashionable, tailor-made, all-wool, 1911 clothes ever worn in your neighborhood. If your personal appearance and a big business is worth a postal or a 2-cent stamp to you, then act now—write us today. Address, American Woolen Mills Co., Dept. 468, Chicago.

WANTED BRANCH MANAGERS for mail order business at your own home. Male or female. No canvassing. Mail the ten catalogues and make from \$1 to \$20. One young married couple made over \$100 in two months. You can do the same. We furnish everything. Outfit, ten catalogues, full particulars, etc., for 10 cents in stamps to pay postage, etc. Address: Ybrad Co., 434 Cortlandt Bldg., New York City.

AGENTS, WHY DON'T YOU WRITE? Send a postal. Doesn't cost much, does it? Agents making \$75 weekly. Why not you? Storekeepers all crazy to buy. 350 varieties Ready Made Show Cards 11x14, printed in colors. Beautiful air brush design, changeable signs and price tickets, too. Also postcards. You can start mail order business, we furnish everything. Send no money. Write a letter or postal for new catalog, printed in colors and sample. These cards will get you going. They spell success, and will make you all kinds of money. Break away and get out into the sunshine and be your own master. Popular Show Card Co., Desk M, 1235 Michigan Ave., Chicago, Ill.

LAMP—200 HOURS OF LIGHT for 1 cent. Makes and burns its own gas from kerosene oil, which is vaporized by a glass bulb burner. Scientific wonder of the world. Lamps used where people have electric lights. Makes it possible to sell to every household. Lamp made entirely of brass. Riches awaiting you. Rush \$1.50. Complete lamp will be sent, charges paid. We guarantee lamp as above stated, or your money returned. Town, county and township agents wanted. Lamp a whirlwind seller. Pat. U. S. A. and foreign countries. New Process Mfg. Co., Dept. 99, Salina, Kans.

AGENTS—To sell the newest electric appliance on the market; sold everywhere there is electricity. In the home and office; liberal profit; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for \$3.50 and saves the purchaser an investment of \$25; write for particulars. The Handy Light Co., 211 Opera Place, Cincinnati, Ohio.

AGENTS, WRITE QUICK for our liberal terms and special offer. Many agents making \$15 a day. Big profits—easy work—satisfied customers. Victor Suction Cleaner is the best and fastest dirt getter. Works by hand—one person operates it—easily moved from room to room—runs on roller casters—has greatest suction—lasts for many years. Every machine guaranteed. Don't delay. Write now. Victor Suction Cleaner Company, 226 High Ave., Cleveland, Ohio.

WE HAVE AN IDEAL SIDE LINE. Nets big returns, \$6.00 to \$10.00 a day easily made. Getting orders for our Safety Matches bearing Dealer's special advertisement. Something new. Sells itself. If you have a few spare moments on your route, this is your opportunity. Pocket sample case. For particulars, address Dept. P, Importers, 2282 East 55th St., Cleveland, Ohio.

BE YOUR OWN BOSS—Sell "Modern-Make-Milwaukee" Specialties, 100% profit. We manufacture and advertise, you sell them. Our agents become independent and own their business. 10c brings sample Burglar Lock. Represent us exclusively. Outfit furnished. Spring catalogue "P" free, write at once. Modern Specialties Mfg. Co., Milwaukee, Wis., U. S. A.

AGENTS, "KALUX" STEEL HARDENING and tempering solution for all tools made from water hardening steels increasing their efficiency by 50 to 300%. Repeat orders from firms using for the past five years vouch for its merits. 25c sample sufficient for two months. Liberal commissions. Metal Hardening Solution Co., Granite Bldg., Rochester, N. Y.

DO BIG SPRING and summer business selling new and winning invention. Over 250,000 sold during 1910; 50,000 first two months 1911. Nationally advertised—a necessity in every home. Preston Harmon writes: "Secured 110 orders first week." Quick sales, large profits, exclusive territory; attractive samples furnished; credit given. The Progress Company, 911, 210 Monroe St., Chicago.

BIG MONEY, PUT MENDETS TOGETHER at home in 10 and 25c boxes. Easy work for all. They mend all leaks instantly in groutware, hot water bags, cooking utensils, etc. No solder, cement or rivet. Millions sold. Special offer to live agents. Own and operate new business. Profits enormous. Write today. Collette Mfg. Co., Box 1116, Amsterdam, N. Y.

SELL SOMETHING ALREADY IN DEMAND. Energetic specialty salesmen make \$2,000 up on our remarkable, original advertising proposition. Unlimited earning opportunity. Reliable advertising specialty salesmen wanted—state selling experience. Agency Dept. Taylor Brothers Company, Rochester, N. Y. Established 58 years.

AGENTS EASILY MAKE \$25 to \$100 per week with greatest labor saving invention. If out for the money, send dime for three samples, wholesale prices, and unique selling plan which is a winner and money getter. Particulars free. Eagle Rubber Company, 213 East Tenth Street, New York.

EARN THIS SUIT in One Hour! Your profit for an hour or two as the representative of our great tailoring house pays for a special made-to-measure suit for you—the handsomest, the most stylish and the most durable ever made. Just show two or three of your friends the samples of our fine wool suitings, take two or three orders and you have earned the suit. You can't fail to get orders. Our 60 beautiful samples create a sensation wherever shown. No one ever saw such materials at the price before. You take no risk. Everything is shipped on approval, subject to 24 hours' examination. Customers try goods on and must be satisfied with style, fit and quality before paying. We pay express on everything! You can undersell everybody. Get clothes for your friends at less cost than they pay anywhere else and make wholesaler's, jobber's and retail dealer's profits. That means the swiftest, cleanest and nicest business in America! A Big Business that more than doubles your earnings. We want you to represent us now. Don't wait until somebody else takes this great business. No experience necessary. We furnish you our portfolio with 60 samples of the latest weaves, fabrics and colors, absolutely free. Do you want this swell made-to-order suit and this remarkably easy money-making business that will make you rich? A postal or letter mailed to us at once gives you swell clothes and a big business. Write us now. A postal card will do. Or tell your friends about it. Paragon Tailoring Company, Dept. 11, Chicago, Ill.

LARUE'S FINE TAR PASTE, and Velvety Paste are fast selling hand cleaning specialties which competition has not touched. Not common soap. Something out of the ordinary. Liberal terms to reliable agents. Samples 10c prepaid. F. C. LaRue Soap Co., 584 Niagara St., Buffalo, N. Y.

ONE ALADDIN MANTLE LAMP AGENT made \$700 in 60 days. Another sold \$50 on money back guarantee and not one wax returned. Burns kerosene (coal oil). Brighter than electricity. Sell themselves on over-night trial. Improved 1911 line is finest in world for homes, offices, public places. Guaranteed. Ask nearest office for agency proposition. Mantle Lamp Co., Desk 567, Chicago, Portland, Ore., Waterbury, Conn., Montreal, Winnipeg, Can.

AGENTS—Biggest money-maker known. The new Canchester Incandescent Kerosene Lamp revolutionizes old lighting methods. Burns air, not money. Six times brighter than electricity, gas or acetylene at 1-10th cost. Burns with or without mantle. Burner fits any lamp. Saves 75% oil. No trimming wicks. Showing means selling. Territory going fast. Write today. Handsome outfit furnished. Canchester Light Co., Dept. P. M. 5, 204 No. State St., Chicago.

AGENTS—\$50 weekly; we manufacture the best needle case made; a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" Envelopes do the work; general agents can make over \$100 weekly; send 10c for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Paty Needle Co., 102 Union Sq., Somerville, Mass.

WANTED—A GOOD LIVE AGENT in every shop in the U. S. to handle on the side an article that is used by every mechanic, automobilist, plumber, and also by the housewife. Nice profits for the hustler. Can make from \$5.00 to \$25.00 extra every month. Free samples. Goods guaranteed or money refunded. No fake. Write: The Klenszla Co., Erie, Penna.

ANY LIVE AGENT CAN make 100% profit working for us. New article, sells for 25c, universal demand, exclusive territory, quick sales. Send now for free sample and terms. The G. V. Sales Co., 150 Nassau St., New York, Room 1325.

AGENTS—Big money for you, introducing our new specialty that sells on sight. Manufactured and distributed by us only. Free sample. Columbine Co., Dept. 9, Boulder, Colo.

BECOME A MANUFACTURER'S AGENT. We manufacture hosiery which outwears 3 of the ordinary kind, replaced free when hole appears. Easy sales; large profits. First reply obtains agency your city. Triplewear Mills, Dept. D, 724 Girard Ave., Philadelphia, Pa.

AGENTS—Positively perfect incandescent lamps. As represented or money refunded. Burns common kerosene oil 16 hours on 1 quart, with or without a mantle, 100 candlepower. Fine proposition. Write at once. American Light Co., Birmingham, Ala.

MEDALLIONS SELL AT SIGHT, 300 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Resag Co., 1295 W. Randolph St., Chicago.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 463 Third St., Dayton, Ohio.

AGENTS: \$30.00 WEEKLY easily made selling our Yankee Self-Wringing Mop and Duster; 500 other fast sellers; samples free. Scheff Co., 1837 Wells Street, Chicago.

AGENTS—HANDKERCHIEFS, DRESS GOODS, Carleton made \$8 one afternoon; Mrs. Bosworth made \$25 in 2 days. No experience needed. Free samples. Credit. Freeport Manufacturing Company, 59 Main St., Brooklyn, N. Y.

WIDOWS, Ladies, Men, New, Interesting. Profitable, easy work. Spare time or permanent. Sell our useful specialties. Our original selling plan will double your sales. Particulars and \$2.00 premium offer free. Fair Mfg. Co., HF51, Racine, Wis.

AGENTS: 100% profit. New patented awl. Sews harness, shoes, grain bags, anything. Sample free to workers. A. Mathews, 1262 Third St., Dayton, Ohio.

THE NOEL KEROSENE MANTLE LAMP beats electricity, gas or gasoline. The most economical light to burn. A whirlwind seller. Customers delighted. Agents write for territory. John S. Noel Co., 10th St., Grand Rapids, Mich.

AGENTS: Send for free booklet, inside information on the agency business. Filled with money making plans. Pointers and experience of thousands of successful agents. Address: J. M. Finch, 1162 3rd St., Dayton, Ohio.

YOU CAN MAKE \$\$\$\$ as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, Newark, N. Y.

OUR STARTLING NEW INVENTIONS. Saxonia Spark Gas Lighter; cheaper than matches; Vacuum Cleaner, cheaper than brooms; Incandescent kerosene mantle lamps, cheapest and best light known. Quick sales and large profits. U. S. A. Lighting Co., Box G, Springfield, Mass.

AGENTS earn \$25 to \$50 weekly selling our latest styles beautiful braided waists, and dresses. Mexican drawn work, petticoats, various embroideries. Catalogue free. National Imp. Co., Desk 27, 699 Bway, N. Y.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

AGENTS—\$75 monthly. Combination Rolling Pin. Nine articles combined. Lightning seller. Sample free. Forshee Mfg. Co., Box 535, Dayton, Ohio.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 406 N. Clark St., Chicago.

\$25 WEEKLY and expenses to men and women to collect names, distribute samples and advertise. Steady work. C. H. Emery, M. K., Chicago, Ill.

SELF-THREADING NEEDLES. 10c a paper. Agents wanted, samples and terms free. Ladies' Art Co., Dept. 41, St. Louis, Mo.

ONE MILLION AGENTS WANTED; fast seller costing 5c, selling 50c. Every firm needs. Orders to \$50. Postal brings samples. Embossed Co., 2497 Milwaukee Ave., Chicago.

AGENTS—PORTRAITS 35c, FRAMES 15c. Sheet Pictures 1c. Stereoscopes 25c. Views 1c. 30 days' credit. Samples and catalog free. Consolidated Portrait, Dept. 1195, 1027 W. Adams St., Chicago.

\$100 MONTHLY and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Steady work. S. Scheffer, Treas., M. P., 125, Chicago.

AGENTS—100% profit. Combination monkey-wrench, plumber's pliers. 15 tools combined. Lightning seller. Sample free. Forshee Company, Box 1335, Dayton, Ohio.

FREE GOLD SAMPLE goes with first letter. Something entirely new. Every firm wants it. Orders \$1.00 to \$100.00. Nice pleasant business. Write today. Metallic Mfg. Co., 404 N. Clark, Chicago.

ACTIVE MEN OR WOMEN to work individually or organize and direct selling crews on patented gas cooking appliance. Saves fifty per cent. Exclusive territory and 100% profit. A. F. Dekker, Sales Manager, 37 E. 28th St., N. Y.

AGENTS—Sell the Pinless Clothes Line. A labor-saving invention; sells on sight; write quick; exclusive territory; \$25 to \$75 weekly; freight prepaid; sample 25c. Pinless Clothes Line Co., 558 Lumber Exchange, Portland, Oregon.

BE YOUR OWN BOSS; Start Mail Order Business at home; devote whole or spare time. We tell you how; very good profits. Everything furnished. No catalog outfit proposition. For "Starter" and free particulars address P. M. Krueger Co., 155 Washington St., Chicago, Ill.

AGENTS: Quit peddling! Do it by mail! Your spare time worth \$25 weekly. Investigate our unique mail business. Amazing profits for shrewd people. Write for details. Fredericks & Co., 776 Unity Bldg., Chicago.

KEROSENE MANTLE LAMPS—One agent writes: "Just sold the fourth burner to one customer—left one on trial—bought three then sold him the fourth today. If you want repeat orders, sell 'Guilford Guaranteed goods.'" Guilford Co., Seville, Ohio.

BOY AND GIRL AGENTS—Sell 24 packages postcards as 10c each and receive camera, aeroplane or rifle free. Address Shurwin Supply Co., 308 West St., Wilkesburg, Pa.

AGENTS—\$1.00 hourly. One handed flour sifter. Just patented. Only one in the world. Sample free. Forshee Mfg. Co., B. 1535, Dayton, Ohio.

SEND YOUR ADDRESS, and we will mail you our catalogue of 750 quick sellers. Over 3,500 guaranteed articles beautifully illustrated in our 4 free catalogues. \$500 prize contest this month. A. W. Holmes & Company, 151 Broad Street, Providence, Rhode Island.

AGENTS—Mail Order Dealers, write us for circulars and prices on two new household articles. Thompson Mfg. House, 187 Schaeffer St., Brooklyn, N. Y., Dept. P.

THE greatest agents' seller ever produced; every automobile owner buys it on sight; big profits. Write to-day. Illustrated booklets. Beyer Specialty Co., Clayton, Mo.

WANTED—RAILWAY MAIL CLERKS; city carriers; postoffice clerks; government stenographers and bookkeepers. Thousands of appointments coming. Average salary about \$1,100. No "Layoffs." Short hours. Annual vacations. Common education sufficient. Political influence not needed. Send your name immediately for schedule showing places of spring examinations. Free coaching. Franklin Institute, Dept. H 53, Rochester, N. Y.

REPRESENT US EXCLUSIVELY in your territory. Build up permanent business by repeat orders. We, as manufacturers of patented household necessities want "I WILL" men on our co-operative plan. If your letter indicates that you mean business, we will outline our plan. J. M. Pense Mfg. Co., Co-Operative Dept. 4000, Buffalo, N. Y.

Agents—Our new line automobile specialties are big winners; large demand; quick sales; big profits; success assured; don't wait; particulars free. Mitchell Specialty Co., Houston, Texas.

SALESMEN WANTED—to sell trees and plants. Free outfit. Commission paid weekly. Write for terms. Perry Nurseries, Rochester, New York.

CASH FOR NAMES. Ideas, formulas, information. Steady, profitable home business. Instructive Booklet free. Information system, 244, Marietta, Ohio.

SPECIALTY SALESMEN the quickest seller on earth make \$50 a week easy, sample one dollar, money back if unsatisfactory. Write quick for particulars. St. Louis Burglar Protection Co., St. Louis.

BULLY! GREAT! IMMENSE! That's what all our agents say after selling our attractive 1911 combination packages of soap and toilet articles with valuable premiums. 100% to 300% profit. One Michigan agent made \$65 in 47 hours; another \$21 in 8 hours; another \$22.50 in 10 hours. Act now—not tomorrow. Davis Soap Works, 264 Davis Bldg., 1429 Carroll Ave., Chicago.

IF TIRED OF WORKING for others send for our big money making propositions. \$1.00 sample and full particulars for 10c. Dietz & Co., 3420 Lincoln Ave., Chicago.

AS YOU CAN CLEAR \$1,500 annually mailing music evenings, why look further? Send only 10c for facts, proof and elegant new sheet music. Weber Music Co., 3527, Boston, Mass.

KEEP YOUR HENS and houses free from lice and mites. Pleasant dreams. Half gallons one dollar. Dept. A, Webb, 2137 Madison Ave., New York City. Agents wanted.

AGENTS in every city and town; best selling automobile specialty; large demand for goods; success assured; start at once. Leo Cruz Co., 31, Riverside, La.

GOOD HUSTLERS, men and women, can make for themselves elegant future, selling "Raincoats." We are manufacturers. New proposition. Write for interesting particulars. Regal Raincoat Co., Dept. 69, 1367 Broadway, New York.

SALESMAN; TAKES ONE MINUTE to sell. Pays you a dollar. Sell ten, twenty a day. Side line. Every salesman or clerk buys because it puts money in his pocket as well as yours. Sales Managers Publishing Co., 125 Sycamore St., Milwaukee, Wis.

GOVERNMENT WANTS RAILWAY MAIL CLERKS, city carriers, postoffice clerks. Write for dates of examinations everywhere. Franklin Institute, Dept. H, Rochester, N. Y.

DO YOU WANT a soliciting or manufacturing county agency of our new advertising plates for business men? Big commission. Mail postal to Roof, Abilene, Indiana.

LIVE MEN WANTED to sell a new and attractive safety razor combination. John Williams & Co., 46 West Broadway, New York.

AGENTS—To sell automobile owners necessary article; make \$5 to \$25 per day; sells on sight. Desk C, Emaus Supply Co., Muskegon, Mich.

GET WISE—Every lady buys latest Dutchess hat plus. Sample 50c, forth \$1. Dozen, \$5. F. J. Seck Co., 192-4 Woodlawn Ave., Jersey City, N. Y.

EXCLUSIVE TERRITORY GIVEN to agents who demonstrate they can sell the best gasoline and iron manufactured. Sample at reduced rates. Herz Mfg. Co., Jackson St., St. Paul, Minn.

AGENTS! You can make \$10.00 a day selling our new high-grade original design show cards to storekeepers. 350 varieties. Catalog free. Samples 10c. Peoples Show Card Concern, 711 W. Madison St., Chicago, Ill.

LIVE AGENTS to sell the only perfect door lock made. Enormous profits. Sells on sight. Safety Link Lock Co., 3734 Cottage Grove Ave., Chicago, Ill.

AGENTS WANTED—Rubber stamps and novelties. Send 4c for full particulars. A. S. Mankin & Co., Alexandria, Va.

AGENTS WANTED to sell our improved patented Match Machine; good side line; for particulars address Lion Machine Co., 64 Second St., Detroit, Mich.

AGENTS—WE MANUFACTURE GLASS PAPER. Plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10c. S. H. Parris & Co., 202 S. Clark St., Chicago.

WANTED—AGENTS—7 CENTS PROFIT EACH 10c sale; best little article ever offered; sample for 3c in stamps. Rawlings, Box 545, St. Louis.

AGENTS WANTED to sell our beautiful scripture wall motives. Frank Shilling Co., Navarre, Ohio.

AGENTS WANTED—25c novelty, housekeepers buy at sight; tea kettle attachment prevents scalding. William Cram, Box 8704, Haverhill, Mass.

AGENTS: SEND FOR PARTICULARS of automobile specialty; fast seller; big profits; free illustrated booklets. Sutton Specialty Co., Saugerties, N. Y.

\$35 WEEKLY SELLING MUSIC. Send 25c for samples (worth \$2.50) and particulars. Home Co., Boston, Mass.

AGENTS wanted selling Masonic. I. O. O. F., Grange, K. of P. charts; write quick for particulars; sample \$1.35, size 22x28. Empire, Stonington, Me.

AGENTS: Do you want an agency that will pay you \$60.00 a month for life, besides handsome premiums free. Box 52P, American Pharmacal Co., Evansville, Ind.

SMALLEST ALARM CLOCK, bible and telescope, 10c each prepaid. W. H. Garner, A-119 South Lafayette St., Evansville, Ind.

AGENTS—BEST SELLER, portable Nail and Screw Holding Cabinets for shop, house, etc. Clean proposition. Billstone & Co., Findlay, Ohio.

AGENTS WANTED—New system bookkeeping. Sample, 40c postpaid. Order today. G. S. Taylor, Jamestown, N. Y.

GAS LIGHTERS: Automatic and Mechanical. Gas Ranges are in use now. L. Sterling Co., Box 766, Trenton, N. J.

LATEST RAT and mouse trap (combined). Gets them all. Sample, 25c. Zerby, Sacramento, Penna.

AGENTS—BOTH SEXES—We control a specialty meter placed on market before. Not for sale in stores. Particulars free, sample 10c. Lelloy Specialty Co., 76 Park Place, Room 52, New York.

SEVEN-IN-ONE New Novelty in jewelry. Scarf pin each day of week. Seven superb imported stones, match any color tie. Agents wanted. Exclusive territory. Investigate. Weeks, 334 Boston, Mass.

AGENTS WANTED—To sell rich looking imported 34x68 rugs at \$1 each. R. H. Carter, Milan, Tenn., sold 115 in 4 days; his profit, \$51. You can do as well. Write for sample offer and unique selling plan; exclusive territory. A. Condon, Rug Importer, Stonington, Maine.

MORE MONEY! Lots of money! Agents! And general Agents! Quickest selling 25c article with beautiful premium. Unique selling plan which pulls orders. Send 10c for sample; handsome premium, circulars, prices, etc. Litholia Pm. Co., 247 W 125th St., N. Y.

100% PROFIT SELLING GORDON Photo Pillow Tops. High grade work. Samples and catalogue free. Luther Gordon Co., 164 Washington St., Chicago.

AGENTS MAKE 100% PROFIT selling our product. Write today for particulars. Taylor & Dine Co., 44 High St., Mansfield, Ohio.

PLEASANT DREAMS KILLS ALL VERMIN. Invaluable to hotels, bars, houses, boats. Exclusive territory. Liberal discount. Dept. A. Webb, 2137 Madison Ave., New York City.

WANTED LIVE AGENT in each locality for high class guaranteed line of paints. Commission basis. The Colorcraft Co., Cleveland, Ohio.

AGENTS, MANAGERS; No-Poison Rat Annihilator. Box 249 Cincinnati, Ohio.

THE STOTZ STUTZ BOOKLET "Successful Sellers. How to Buy, Cash or Credit. How to Sell," was written for the man or woman agent; for the teacher wishing to make money during vacation; for the student working his way through school. Stotz Stutz lists successful sellers only, saving you the time and expense of answering advertisements for agents. Join the Stotz Stutz Sellers by sending 25 cents, coin, to P. O. Box 838, Pittsburgh, Pa., and get absolutely disinterested advice, with brains and ideas to draw upon for future help. Do it now.

YOU CAN EARN from \$10.00 to \$60.00 extra every month by selling "Peerless" Belt Dressings to your friends. Write now. Peerless Belt Dressing Co., Cleveland, Ohio.

LIVE WIRE SALESMEN, sell our own make brushes for every household use. Write for particulars, territory and the eight advantages of our proposition, 125% profit. Capitol Brush Co., Hartford, Conn.

EXCLUSIVE HOUSEHOLD SPECIALTIES: actual necessities; samples and catalogue free. Write today. Philip O'Donnell Co., Stoughton, Mass., Dept. B.

LIVE AGENTS to introduce article needed in every home. Fast seller, large profits. Customers waiting for it. For particulars, write The LaPlace Specialty Co., Box 27, LaPlace, Ill.

VACUUM CLEANERS ARE SELLING fast now. Get our special agency offer on a guaranteed high grade Hand Power Machine with blower attachment, 9 ft. hose and fifteen extra attachments for cleaning everything. Victor Cleaner Company, McClurg Bldg., Chicago.

AGENTS MAKE MONEY, selling the Dollar Adding and Subtracting Machine. Particulars free, B. Bassett, 5921 Indiana Ave., Chicago.

BOKARA DIAMONDS—Agents, everyone to wear and sell our famous Bokara Diamonds. Write for sample offer and catalogue free. Northwestern Jewelry Co., 52 Northwestern Bldg., Chicago.

MANUFACTURE AND MARKET your own goods. Practically all profit. Information free. Barstow Company, Box 18, Oakland, Calif.

GERMAN SILVER KEY CHECKS—Steel letters for marking name, key rings, etc.; over 30 styles. Agents wanted. Sample marked with your name and address, and key ring, 15c. Pease, Die Maker, Winchester, N. H.

AGENTS—FOR HOUSEHOLD NECESSITY; enormous profits; sells like wildfire; send for sample and terms. Rose City Novelty Company, Dept. A., Box 2110, Portland, Ore.

MONEY MAKER—Only half the work pumping water when using spring attachment. Equalizer Spring Works, 549 Quincy St., Chicago.

INVISIBLE POCKET PEN and Pencil Holder. Beats them all. Get busy you agents. Sample 10 cents. Nouveau Sales Co., Box 92, Raleigh, N. C.

GOLD SIGN LETTERS—Sell everywhere; agent's profit over 500%; sample free. Johnston Co., Quincy, Ill.

KEY CHECK MEN, ATTENTION. If you are paying over \$12 per thousand for German silver emblem checks, join our club. Pease, Die Maker, Winchester, N. H.

BOATS, LAUNCHES AND STEAMBOAT MACHINERY

MODELS—CASTINGS, FITTINGS, DRAWINGS and instructions. Build a model steam or gasoline engine, dynamo, motor, motor boat, etc. outfit, in your spare moments. We furnish the material and instructions, you contribute a few hours pleasantly spent. Finished models carried in stock. Send plans of your ideas; we furnish estimates on models of all descriptions. Enclose two cents for illustrated booklet. The B. A. B. Model & Mfg. Co., Room 536 B, Singer Bldg., 149 Broadway, N. Y.

MAGNIFICENT RIVER CRUISER MARJORIE; forty footer; perfect condition. Price \$2,200.00. Worth Seven Thousand. L. S. Bernheim, Louisville, Ky.

HELP WANTED

WANTED ONE THOUSAND CHAUFFEURS and repair men. Our demand for automobile engineers exceeds the supply. Calls for men of intelligence and mechanical bent capable of commanding \$100.00 to \$150.00 per month upon graduation. Resident course \$20.00 to \$60.00. Home Correspondence course completed by practical road and shop work at this school, highly successful. Look this up. Auto Schools of America, Dept. T, 1600 Michigan Ave., Chicago.

\$3,000 to \$10,000 YEARLY in the Real Estate business, without capital; we will teach you the business by mail, appoint you special representative in your locality, of leading real estate company, list with you readily salable properties, co-operate with and assist you to permanent success; a thorough commercial law course free to representatives. If you are honest and ambitious, our free 62-page book will surely interest you. Address, International Realty Corp., Dept. 1534, Chicago, Ill.

WANTED—RAILWAY MAIL CLERKS: City Carriers; Post-office Clerks; Government Stenographers and Bookkeepers. Thousands of appointments coming. Average salary about \$1,100. No "Layoffs." Short hours. Rapid promotion. (Postmaster General Hitchcock, commenced as clerk.) Annual vacations. Common education sufficient. City and country residents stand same chance for immediate appointment. Political influence not needed. Send your name immediately for schedule showing places of Spring Examinations. Free coaching. Franklin Institute, Dept. H21, Rochester, N. Y.

FREE! FREE!—A complete course in Show Card and Sign Writing to those purchasing small assortment of "Litholia," ready to use colors for show card writing and artists' use. Great opportunity to earn big salary, or establish money-making business. Information free. Litholia Pm. Color Co., 247 W. 125th St., New York City.

WE HAVE A STUNNING PROPOSITION for an Engineer and traveling salesman in every Village, Town and City in U. S. Little time required. Will not interfere with your work. Particulars. Address, P. O. Box 24, South Stillwater, Minn.

RAILWAY MAIL CLERKS WANTED—Average salary \$1,100. Alternate weeks off with full pay. No "Layoffs." Common education sufficient. Preparation free for coming examinations in your section. Franklin Institute, Dept. H21, Rochester, N. Y.

WANTED, AGENTS, MACHINISTS, ATTENTION! Increase salary, new revised Saunders' Hand Book of Practical Mechanics. Best ever ready reference. Thousands in use. Postpaid \$1.00 cloth; \$1.25, \$1.50 leather flap. Big profits. E. H. Saunders, 216 Purchase St., Boston, Mass.

CASH FOR NAMES, ideas, information, formulas. Steady, profitable home business. Instructive booklet free. Information System, 245, Marietta, Ohio.

500 MEN 20 TO 40 years old wanted at once for Electric Railway Motormen and Conductors; \$60 to \$100 a month; no experience necessary; fine opportunity; no strike; write immediately for application blank. Address Railway, X510, 203 Dwight Bldg., Kansas City, Mo.

WANTED, RELIABLE GENTLEMAN OR LADY in every city, something new; waterproof sanitary rug; both sides are alike; sells in every home; \$40.00 weekly easily made; every rug guaranteed. Start now; full size rug sent prepaid upon receipt of \$1.00. For particulars address Dexter Supply Co., 508 S. Dearborn St., Chicago.

BIG MONEY WRITING SONGS. Thousands of dollars for anyone who can write successful words or music. Past experience unnecessary. Send us your song poems, with or without music, or write for free particulars. Publication guaranteed if acceptable. Washington only place to secure copyright. H. Kirks Dugdale Co., Dept. 265, Washington, D. C.

YOU ARE WANTED for government positions, \$80.00 month. Annual vacations. Short hours. No "layoffs." Common education sufficient. Over 12,000 appointments coming this year. Influence unnecessary. Send postal immediately for list of positions open. Franklin Institute, Dept. H21, Rochester, N. Y.

DON'T YOU WANT TO MAKE YOURSELF A Real Estate Broker? We will make it easy for you without capital. You can be independent of bosses and have your own office instead of a job—selling big deals and make big commission instead of working at details on a salary. Write today for booklet "P." No financial backing needed. U. S. Real Estate Institute, 500 Fifth Ave., New York.

PLUMBING, ELECTRICITY, BRICKLAYING or Mechanical Drafting, taught by expert workmen. Short time and small cost. Positions always open. Catalogue free. Write today. Coyne National Trade Schools, 80 E. Illinois St., Chicago.

EXPERIENCED OR SUCCESSFUL SALESMEN to sell gasoline lighting system suitable for any place or purpose; attractive proposition. Write for catalogue. Bond Lighting Co., 174 N. Sangamon St., Chicago, Ill.

WANTED—A man or woman to act as our information reporter. All or spare time. No experience necessary. \$50 to \$300 per month. Nothing to sell. Send stamp for particulars. Sales Association, 601 Association Bldg., Indianapolis, Ind.

WANTED—GOOD ABLE-BODIED MEN as Interurban Motormen, Conductors. \$65 to \$90 per month. New lines under construction. New positions opening up. Experience unnecessary. Rushes stamp for map new traction lines. I. Railway Co., L, No. 16, Indianapolis, Ind.

\$100 TO \$150 A MONTH paid to chauffeurs, demonstrators and truck drivers; no experience necessary. Write for free tuition certificate. Sweeney's Automobile School, 1436 Woodland Ave., Kansas City, Mo.

I WILL START YOU earning \$4 daily at home in spare time. silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

MANY GOVERNMENT POSITIONS ARE OPEN. Spring Examinations everywhere. Large salaries; short hours; annual vacations. Write for list of positions, Franklin Institute, Dept. H21, Rochester, N. Y.

"PATENTS AND PATENT POSSIBILITIES," a 72-page treatise sent free upon request; tells what to invent and where to sell it. Write today. H. S. Hill, 905 McGill Building, Washington, D. C.

TRAVELING SALESMEN WANTED!—Our machine pays for itself each month; salesmen sell 40 per cent firms visited; commission \$46, Damon Co., Bowling Green, Ky.

PINLESS CLOTHESLINE AGENTS coin money. Sample prepaid. 25c. 503 Lumber Exchange, Portland, Oregon.

WANTED DISTRIBUTERS of advertising matter everywhere. Oliver P. Barkley, Mount Pleasant, Pennsylvania.

ORGANIZERS AND INDIVIDUAL WORKERS, \$50.00 to \$150.00 month. Whole or spare time. Box B-293, Covington, Ky.

GOVERNMENT WANTS RAILWAY MAIL CLERKS—City Carriers, Postoffice Clerks. Write for dates of Examinations everywhere, Franklin Institute, Dept. H21, Rochester, N. Y.

SHORT METHODS—Mechanical Draftsmen are paid \$150 monthly. Complete course at your home 4 months. P. O. Box 433, Newark, N. J.

IF YOU can read and write and are willing to try, we will teach, train and equip you to be a top-notch, scientific salesman, a splendid position with us is then yours; no previous experience necessary. We want "I Can" and "I Will" men for our permanent sales force. This is an opening for the man who wants to be a real salesman, with exceptional money-making opportunities. If you believe in doing business on a "100 per cent honesty basis," if you want "success," if your wishbone is not where your backbone ought to be, write us today for particulars. Stace, Burroughs & Co., (manufacturers representatives), 319 Michigan Ave., Offices 750, Chicago.

MEN WANTED, age 18-35, for firemen, \$100 monthly, and brakemen \$80 on all railroads. Experience unnecessary; no strike. Positions guaranteed competent men. Promotion. Railroad Employing Headquarters—over 400 men sent to positions monthly. State age; send stamp. Railway Association, Dept. 89, 227 Monroe Street, Brooklyn, N. Y.

SALES LADIES WANTED to sell Black Silk Petticoats, direct from Silk Mills, can earn \$10 to \$50 weekly. Particulars free. Address P. & B. Skirt Co., Lynn, Mass. Advt. Dept.

WANTED—A first-class foreman for a plant that manufactures hardware specialties, stove trimmings, stove bolts, rivets, etc. Address F. W., 318 W. Washington St., 6th Floor, Chicago.

"VALUABLE TRADE SECRETS," see Miscellaneous column. Gold mine of information.

MANUFACTURING MACHINERY

THE PIERCE MODEL WORKS, 85 5TH AV., CHICAGO. Models, dies, tools and manufacturing of patent articles; catalogue of model supplies.

WANTED: To get in correspondence with some party who has a good marketable machine to manufacture. We have the machine shop and capital if you have a good article. Lexington Machine Works, Lexington, Ky.

YOUR INVENTION MANUFACTURED at lowest cost. We are equipped for all kinds of metal specialty work. Designs perfected, etc. C. Spira Mfg. Co., New York.

PATTERNS AND CASTINGS MADE. Send sketch for estimates. "Mail Order" Garage, No. 3 Fox Street, Bridgeport, Conn.

WANTED—1,000 spring motors, about 15 pound capacity; what have you? Merchants Supply Co., Kansas City, Mo.

CEMENT

IF YOU WANT the best information on cement and concrete construction, subscribe for Concrete, leading cement and concrete monthly. Sample copy, 10 cents. Yearly subscription, \$1.00. Concrete, 135 Newberry Bldg., Detroit, Mich.

DOGS, POULTRY AND LIVESTOCK

WORLD'S BEST STRAINS of Lordly Black Langshans, Rhode Island Reds and Bantams. Eggs, \$2.00 per 15; \$6.00 per 100. Ohio Improved Chester White Hogs; weaned pigs, \$10.00; 125 lb. sows, \$15.00. Bred Gills, \$25.00. Fashionable Collie Pups, our specialty, \$10.00 to \$25.00. White Neck Collie Kennels, Box 187, Brownsburg, Ind.

GOLDEN BUFF LEGHORNS—None better. Splendid layers. Silver cup winners. 30 fresh eggs, \$3.00 and \$5.00. Agnes Smiley, Bradyville, Iowa. Page Co.

INDIAN RUNNER DUCKS, white egg strain, healthy, farm raised. Eggs, \$1 for 12, \$3 for 50, \$5 for 100. Leslie Bullion, Route 1, Rockville, Ind.

STEEL STAMPS, STENCILS, DIES, ETC.

STAMPS, STENCILS, SEALS, CHECKS, PUNCHES AND DIES. Presswork. Dickey-Grubler Co., Cleveland, Ohio.

PIANOS AND MUSICAL INSTRUMENTS

CONN-QUEROR CORNETS, \$30.00. Holton Cornet, \$35.00. York Professional Cornet, \$35.00. All silverplated. J. Plach & Bro., St. Louis, Mo.

VIOLIN FOR SALE—Sweet-toned Stradivarius. Write Miss Bertha Mardes, Route 5, Rosedale, Kansas.

MACHINERY AND TOOLS FOR SALE

HARRISON KEY FILING JIG (Improved). No locksmith or Superintendent of large buildings can afford to be without one, makes accurate duplicate pin tumbler lock keys at once, never touching original key with file. Send for new price list just out; within reach of everybody. Harrison & Co., 81 New St., New York, N. Y.

FOR SALE: 50 slightly used Radio Storage Batteries, 6 V. No. 660, \$5.50 each. One Viascope picture machine, complete, good as new, \$40.00, 100 new 8", 110 V. A. C. fans, \$7.50 each. We guarantee all our goods or money refunded. Electrical Supply & Salvage Co., 529 W. Van Buren St., Chicago, Ill.

4 H. P. MARINE ENGINE all equipped, \$35.00; 12 H. P. two cylinder, two cycle water cooled auto engine, \$85.00; three cylinder 20 H. P. water cooled two cycle auto motor all equipped, \$125.00. We can save you money on your engines, any size, trial allowed; get our free catalogue. Chimax Electric Works, New Salem, Mass.

GAS ENGINES, 3-6-10 & 20 H. P. Also large stock Lathes, Planers, Drill Presses and other metal working machinery. Western Machinery Co., Cincinnati, Ohio.

MOTORS: For sale, cheap, 100 1/12 H. P. brand new, Western Electric \$15.00 motors, D. C., 110 V. and 220 V., for \$5.75 each. If motors are not satisfactory we will cheerfully refund money. Electrical Supply & Salvage Co., 529 W. Van Buren St., Chicago.

ENGINE CASTINGS, 1 1/2 horse vertical gasoline, air-cooled, \$7. Three horse marine water-cooled, \$9 cash; drawings included; catalogue for stamp. Novelty Manufacturing Co., 833 West Sixth St., Cincinnati, O.

STEAM BOILER OUTFITS Complete; 1 1/2 Horse Power 20" diam., 51" high, \$40.00. Page Boiler Company, 815 Larrabee St., Chicago.

ENTIRE EQUIPMENT of Statuary Bronze foundry. Also gas engine milling machine, 3 ton Harrington hoist, flexible shaft. M. H. Mosman, 43 Chapin St., Chicopee, Mass.

FOR SALE—Rebuilt: Throttling, Automatic and Corliss Engines, Boilers, Pumps, Heaters, Machine Tools, Tanks, Saw Mills, and general machinery, at bargain prices. Let us know your wants. The Randle Machinery Co., 1761 Powers St., Cincinnati, Ohio.

FOR SALE—Gasoline Engines, automobiles, marine and stationary, also castings. Second hand ones taken in exchange and for sale. Apply with stamps. B. W. Richardson, R. No. 36, Peoria, Ill.

FOR SALE—Engine lathe, swings 9 1/2 in., takes 25 in. between centers. Complete with full set change gears to cut all size threads, 3 to 40 in.; price only \$43.50. Address L. F. Grammes & Sons, Allentown, Pa.

TWO-CYCLE, TWO-CYLINDER 4 in. by 3 1/2 in. marine and automobile gasoline engines 10 hp., at \$84 complete. Castings and drawings of same for sale. Richards Iron Works, Manitowish, Wis.

LATHES—Send for free circular showing bargains on small Screw Cutting Engine Lathes. S. B. Machine Tool Co., Dept. 1, South Bend, Ind.

JOINTER HEADS 6 to 16 in. with cast iron frame that head runs in ready to bolt to wood table. Write for circular and prices. W. L. Sherwood, Kirksville, Mo.

FOR SALE CHEAP: Two second-hand gasoline engines. One marine 6 H. P. One Upright 3 H. P. C. E. Doty, 1003 East 7th St., Muscatine, Iowa.

FOR SALE: Triple expansion marine engine, 11 1/4" x 16" x 22 1/2" x 18". Twenty H. P. Nash gas engine. Geo. J. Adams, 39 South St., New York.

EMERY GRINDERS—all sizes for the shop or factory; write for folder. C. King Bros. Machine Works, Spring City, Tenn.

MUST SELL AT ONCE! Two brand new W. E. direct connected exhaust fans, equipped with Blackman and Fuller blades, 60" at \$225.00, cost \$450.00; 1 1/2" at \$275.00, cost \$600.00. 110 V. D. C. Bargains in all kinds of fans and motors. Electrical Supply & Salvage Co., 529 W. Van Buren St., Chicago.

DYNAMO OR MOTOR CASTINGS, wire, etc., complete, \$2.00. Working specifications, 10c. Hugh Byar, Ke'worth, Ill.

FINISHED CASTINGS COMPLETE for 500 watt enclosed dynamo, \$29. Art. P. Fletcher, Lowell, Mich.

WANTED—all kinds of machinery for manufacturing machine shop. Fred. Dickw, 33 So. Desplaines St., Chicago.

ONE 4 x 6 Triplex power pump. McKeesport Brick Company, McKeesport, Pa.

LITHOGRAPHIC MODELS—Series of 6 subjects—Wireless Telegraph—Motor Car—Dynamo—Steam Engine—Steam Turbine—Gas Engine—Size 8x14 inches—All the parts of these mechanisms are shown and numbered to correspond to printed keys of names. Price per set of 6—\$2.50 or 50c each postpaid. Popular Mechanics Book Dept., Chicago.

PULLEYS, GEARS, SPROCKETS, Shafting Hangers; see page 140. W. A. Jones Foundry & Machine Co., Chicago.

ELECTRIC MOTOR—3 hp., 2 phase, 550 volts, 133 cycles. Stanley make. W. G. Snyder, 37 State St., North Adams, Mass.

TO RENT—Electric Motors, all sizes. Send for list and rates. Gregory Electric Co., Chicago, Ill.

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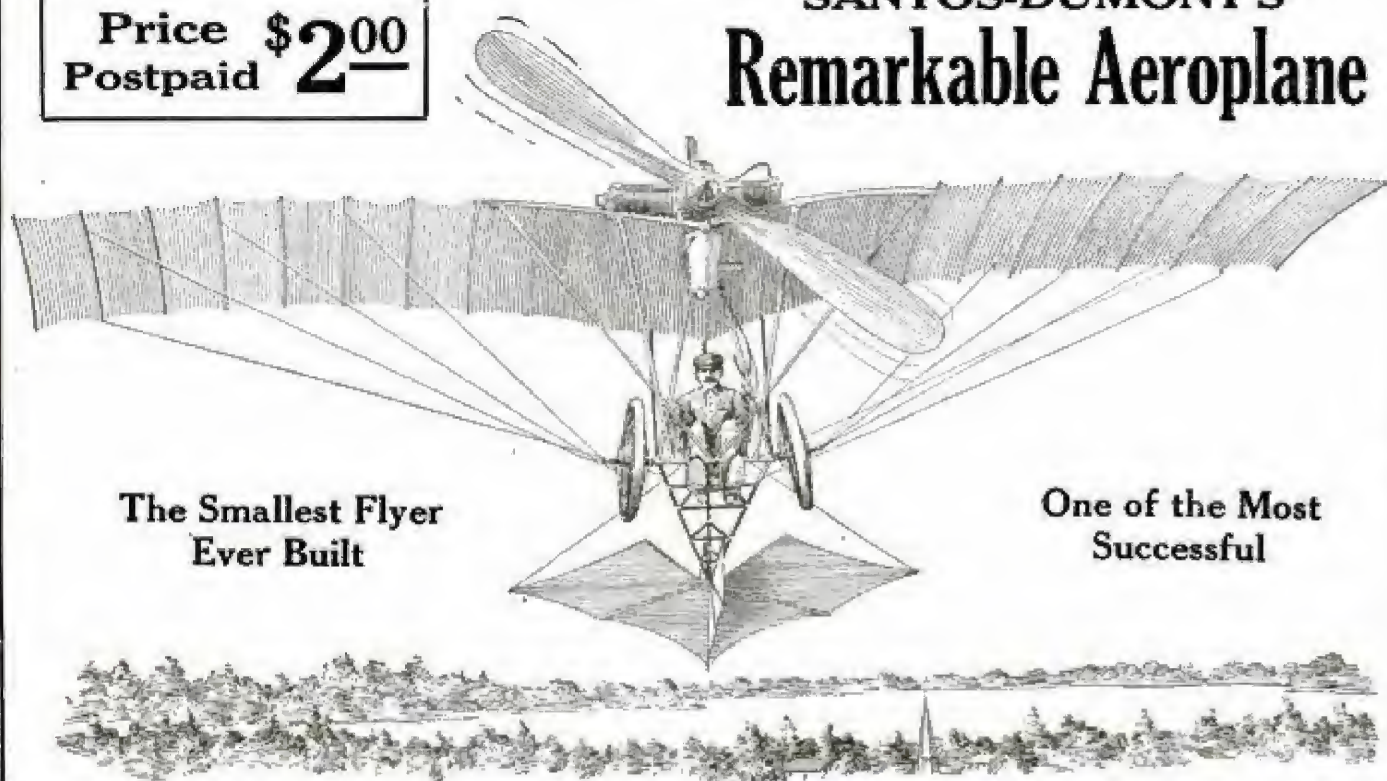
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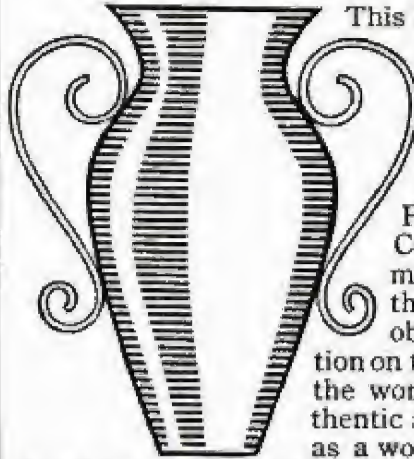
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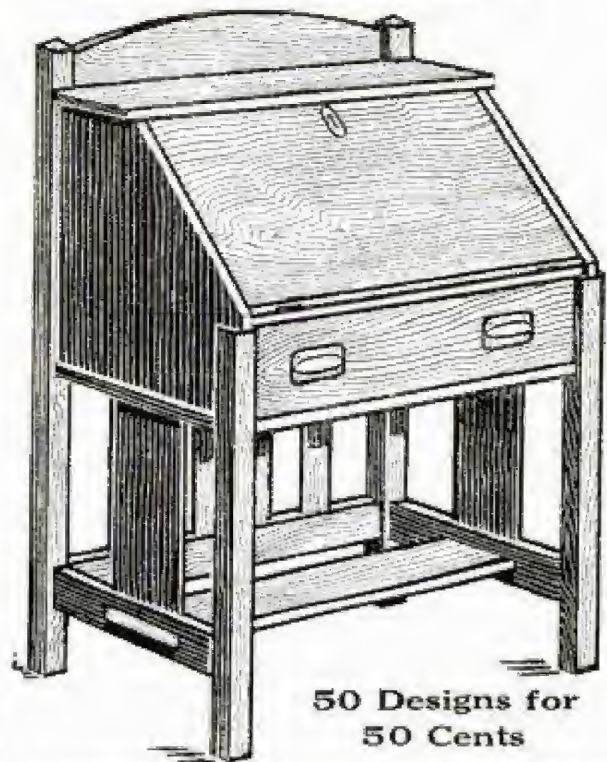
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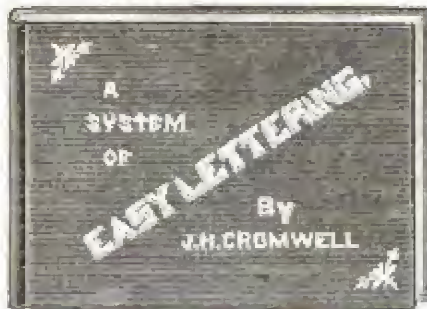
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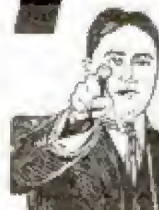
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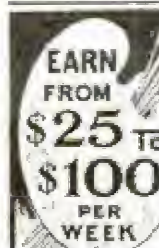
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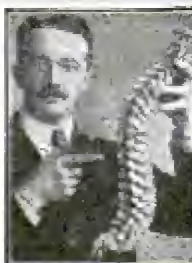
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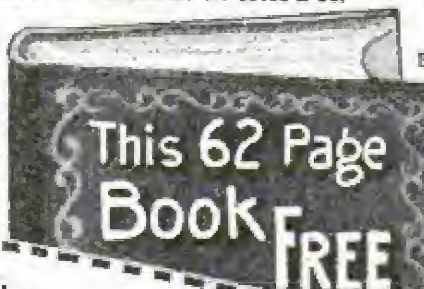
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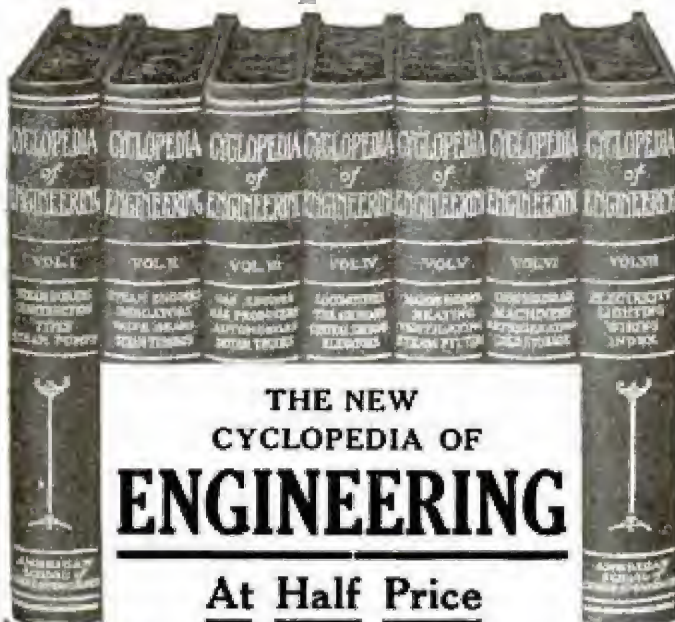


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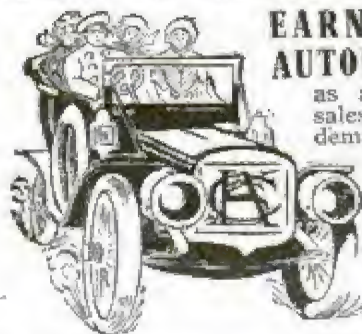
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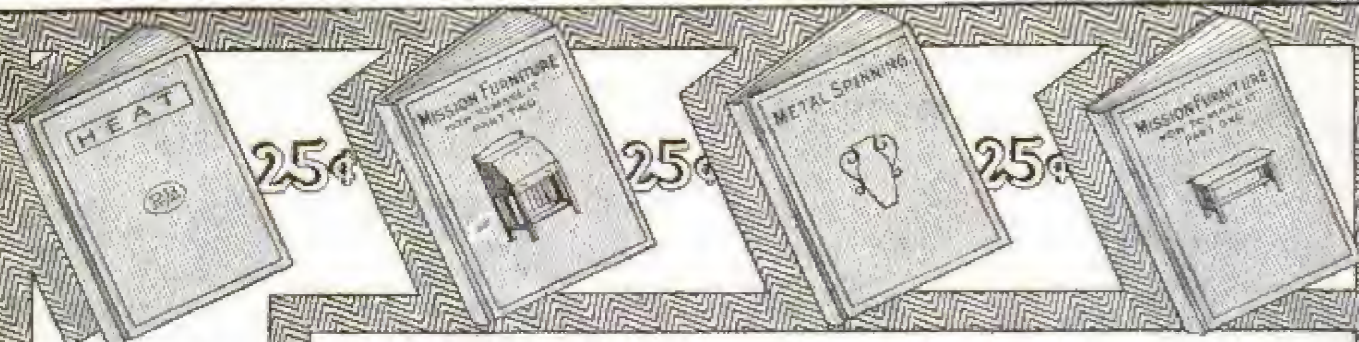
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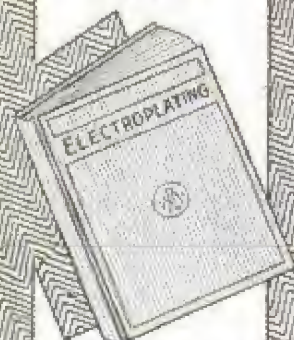
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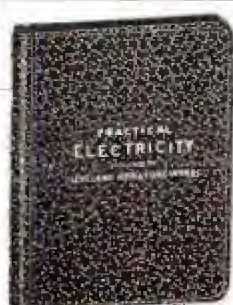
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Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 15

MAY, 1911

No. 5

HEIGHT LINE SUPPLANTS THE AGE LIMIT IN STREET CARS



Every Child Who Can Walk Under the Height Line Rides Free

ANY person under 41 in. in height can ride free on the cars of a Pittsburg interurban electric road. That is the average height of the American child of five years, and the question of whether a person is above or below that figure in stature can be accurately determined on every car of this company's line. A white line just 41 in. from the floor of the car has been painted on one of each pair of car doors. The rules of the company require all

children five years old and over to pay fare. As there were constant disputes as to the age of children brought into the cars, a way out of the difficulty was found in the establishment of a "height line." The proper height was determined by obtaining figures from insurance companies as to the average height of a five-year-old American child. The managers of the Pittsburg road declare that the method has eliminated disputes between passengers and conductors.

FIREFIGHTERS IDEALIZED BY SCULPTOR

To show in sculptured bronze or marble an idealization of the common-



"Heroes of Peace"—"Play Away, Thirty-One!"
by John Paulding

place things of life is the ambition of a Chicago artist who attracted some little attention during an exhibition in that city with a group he called "He-

roes of Peace" which showed three firemen holding the nozzle of a hose pipe, braced and waiting for the water to be turned into it. The group represents the usual crew of three pipemen and they are represented as having advanced over a fallen wall with their pipe. Every detail of the costume and apparatus is faithfully reproduced. One of the men is signaling with his hand above his head and the sub-title of the group is "Play Away, Thirty-One!", this being the order the man whose hand is raised is supposed to be giving. This, too, is strictly in accordance with the ways of the firefighters and is the method they use in signaling their readiness to play the hose at any point to which they are directed.

OBSOLETE WARSHIP ADRIFT

The obsolete French warship "Richelieu," broke away from the tugs while being towed from Toulon to Rotterdam and drifted off Brest in the path of the transatlantic liners, striking the Retarrier rocks of the Scilly islands, and floating free again to become a danger to sea traffic. The British warship "Inflexible" was sent out to search for the derelict, and interposed herself to windward as a



Obsolete French Warship Being Towed Out of Track of Transatlantic Liners

floating breakwater, so that the tugs, thus screened, could get hold of the wanderer. She will be broken up for junk.

LONG SKIRTS PROHIBITED ON NUREMBERG STREETS

A French writer who has made a tour of Europe and America to study street hygienic measures found two cities where trailing dresses are absolutely forbidden on the streets. These places are Nuremberg and Nordhau-

ser, Germany, where the violation of the trailing-skirt ordinance is punishable by a fine. At other places of Austria and Germany the authorities are content with posting placards requesting women not to wear trailing skirts or at least to carry the trains in such a manner as not to raise objectionable dust.

The short walking dress of the American women and the anti-spitting ordinances more or less enforced in most of the American cities were praised by the French investigator.



House in Girard, Ohio, Wrecked by Poles and Cables Caught by Speeding Wrecking Engine

WRECKING ENGINE WRECKS TELEPHONE SYSTEM

The telephone service of Girard, Ohio, was wrecked recently by an unusual kind of accident, the agency responsible for the trouble being a railroad wrecking engine, which was rushing through the town in the night to reach the scene of an accident. The engine was equipped with a large derrick, the long boom of which caught up the wires and cables of the telephone company where they crossed the rail-

road's right-of-way. Before the engine could be stopped, nine poles were torn down and bumped against houses, many windows in buildings near the tracks were smashed, and one corner of the house shown in the illustration was wrecked by the cable. Three of the poles were stopped by this house. Farther down the yards, the telephone cable wrapped itself around one of the railroad towers.



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THE BATTLE IN THE CLOUDS

The effect of a battle between aeroplanes was secured by the photographer by accident. The peculiar picture was obtained through a double exposure, two aeroplane photographs being made on the same negative. Both happened to be made the same day and within a short time of one another from almost the same viewpoint.

SAN FRANCISCO'S SAFETY AND LOADING ISLANDS

The safety and car-loading islands in the center of Market street, San Francisco, are proving so successful that other cities in the country are beginning to take notice. Market street is the main artery of the great reconstructed western metropolis and practically all the car lines entering the downtown district traverse it. Although a wide street, it is congested, and the slightly elevated islands or stations, on which pedestrians can stand while waiting for a car or use as a safety area in crossing the street, were necessary.

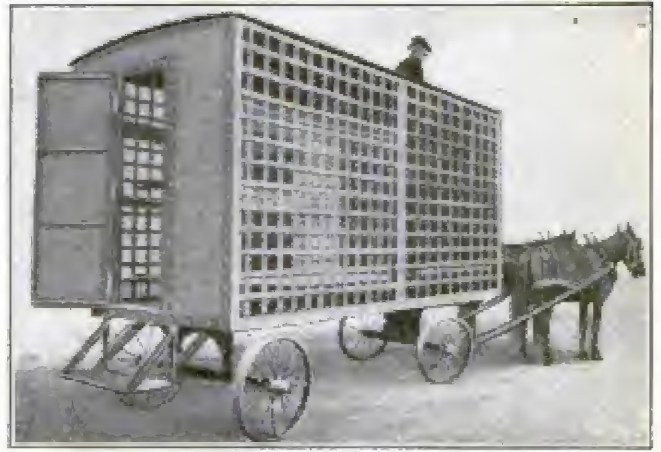


A Safety Island and Car-Loading Station in Center of Market Street, San Francisco

The stations, constructed of concrete, are 60 ft. long, and provided with ornamental lamp standards at either end with seats at the bases.

JAIL ON WHEELS

East Point, an incorporated suburb of Atlanta, Ga., has gained the distinction of being the most accommodating little city in the South. Besides having all the conveniences of modern city life, East Point has provided the law-breaking element with a jail on wheels, and, instead of dragging an obstreperous drunk to prison, the town constable hitches a couple of horses to the prison, drives over and loads up. On



A Portable Lockup

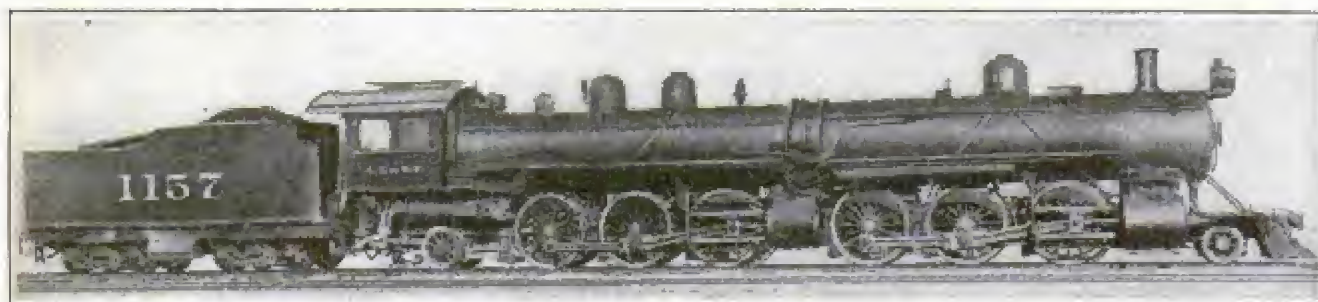
trial day the load of malefactors is towed over to the courtroom in it. This portable prison has accommodation for 12 prisoners. The prisoners are also conveyed from place to place to work on roads, etc., this being the practice in the state of Georgia.

BOTH GRAVESTONE AND SUNDIAL

In an old graveyard near Barmouth, Wales, is a stone cross which is both a gravestone and a sundial. The shadow is cast by the arms and sides of the inclined cross in a very ingenious way, the hours being cut in the sides of the cross shaft. The time indicated by the shadow at the moment the gravestone was photographed is about 10:30.



Both a Gravestone and a Sundial



Mallet Locomotive with Articulated Boiler Formed Out of Two Prairie-Type Locomotives by the Atchison, Topeka & Santa Fe Railroad

TWO LOCOMOTIVES MADE INTO ONE

That the Mallet principle of locomotive design is adapted to solve the question of the disposition of the older and smaller locomotives by combining two such locomotives into one, or by adding a new front section to an existing locomotive, is being demonstrated by the Atchison, Topeka and Santa Fe Railroad.

Two Prairie-type freight locomotives have been converted into a single Mallet locomotive in this company's shops at Topeka, Kan., and are now in service in this form. Careful investigation, however, has demonstrated, that adding a new front section to an old locomotive, is more satisfactory and economical than combining two old locomotives, consequently 14 locomotives are being converted in this manner. Combining two locomotives depletes the total of locomotives in service, while the addition of a new front section to one old locomotive increases the capacity to the same extent and at the same time does not affect the number. The cost of a new front section is also considerably less than that of a complete locomotive.

The unique feature of the two Prairie-type locomotives combined

into a single Mallet is the flexible joint permitting the articulation of the boiler. It was designed by a draftsman in the Topeka shops, and permits the forward section of boiler to move contiguously with the forward wheel section.

FIVE MILLION DOLLARS FOR AN IDEA

According to reports from England, James Hodgkinson, of Salford, has sold the American rights to his process of salt making for \$5,000,000, and a royalty. The Canadian rights have been sold to the Canadian Pacific Railway, but the price has not been announced.

It is claimed that the invention is not only an improvement in salt making but is revolutionary. It is said that it will produce salt four or five times as easily as the present process, will save three tons for every four tons of coal now consumed, will make the various qualities of salt and every size of crystal simultaneously by the use of a single regulated fire, will produce by a process of pure crystallization a salt equal to the present finest ground salts, and will secure an automatic discharge of the salt from the pans.

The experimental plant consisted of three covered and four uncovered pans, all heated from one fire instead of from seven, as at present. Uniform temperature is assured by means of a patent stoker, and the intensity of the heat furnished each pan is under the control of a special draught system.



Prairie Type of Locomotive, with Two of Which the Mallet Engine Was Built



CIRCLING THE LEANING TOWER OF PISA

The famous leaning tower of Pisa, from the upper galleries of which Galileo made the famous tests with falling bodies, proving that globes of different weights, dropped from the same height reached the ground in the same time, was recently circled by an aeroplane operated by Mario Cobiانchi, an airman of Bologna.

A "SOMERSAULTING" BICYCLE

A trick cyclist has been entertaining amusement seekers in Berlin by turn-



Trick Cyclist Performing the "Salto Mortale."

ing somersaults on a bicycle, which is especially equipped as shown in the illustration, for such feats. The arch provides a support for the head and back of the cyclist as he makes the turns.

CHEMICALLY PRODUCED LACE

The lace manufacturers of Lyons, Calais, and Caudry have for some time been much perturbed, according to S. M. Taylor, U. S. consul at Nottingham, Eng., over the advent of a so-called artificial lace. The manufacture of this lace is simple, no weaving being required. The machine that produces this lace consists in its essential parts of a receptacle containing a cupro-ammoniacal solution of cellulose, a cylinder on which is engraved the negative of the lace design, and a coagulation vat. A rotary motion is given the cylinder and the solution flows over it, entering the interstices of the engraved pattern and fixing itself in the coagulative liquid. The result is a lace texture ready to be dyed and dressed.

The "artificial" lace, is said by Consul Taylor to be beautiful in appearance, homogeneous and unalterable, more durable and less combustible than ordinary lace, and not affected by water. Any desired pattern may be obtained by engraving cylinders.

EXPORTS ELECTRICITY TO MEXICO

The electric power plant of the Copper Queen Co., Douglas, Arizona, is preparing to export electricity to El Tigre, Mexico, 65 miles distant. Before the 40,000-volt transmission line could be constructed across the border, several novel questions had to be decided, one of which was whether or not electricity came under any of the heads of commodities upon which a duty could be assessed. The decision admits electric energy free of duty.

BRACE-OPERATED JACK

The newest thing in jacks especially designed for automobile purposes is operated by a long brace of the shape used for making deep bores through wood. The new jack does away with the disagreeable crouching down and pumping accompanying the use of the ordinary types of jacks.



Place the Jack, Turn the Brace, and Up She Goes

CARTING A 62-TON GIRDER ACROSS NEW YORK



62-Ton Girder Passing Under Brooklyn Bridge Structure

The tremendous weight of the 40-story tower of New York's new municipal building* will rest upon five massive steel girders, the smallest of which weighs 50 tons. They were all transported from the river front at Battery Place to the site of the new structure on a 100-ton truck drawn by 33 horses. The girder shown in one of the illustrations during its trip through



Front of 100-Ton Truck with 14-In. Wheels

New York's streets weighs 62 tons.

The tackle by means of which the girders were lifted from the lighter to the truck and finally deposited in place on the tower founda-

tions was especially constructed for the purpose, and handled the massive pieces of steel as easily as ordinary tackle handles a single I-beam. The truck's front wheels have a 14-in. tread.

THE MARKINGS OF OLD ENGLISH SILVER

The positive knowledge as to the period and date of manufacture of old English silver makes its collection of the greatest interest to connoisseurs.

To one fully posted there is no uncertainty, as every genuine piece must have its hall marks. The Goldsmiths Guild, established in 1180, to guarantee the

work done by the gold and silversmiths of England, received its first charter from the crown in 1327, and since 1300 every authentic piece of silver made in England has been stamped with the hall marks in the guild hall at London, or in the guild halls at Sheffield, Chester, Birmingham, Exeter, and Newcastle-on-Tyne.

The hall mark adopted about the year 1300 was a leopard's head and all silver produced in England was stamped with it by the guild. Until 1776 the head was shown with whiskers, and after that year without. Until 1822 the leopard's head was crowned, but from that time to the present the crown has been absent. About the year 1478, a date letter was adopted in conjunction with the leopard's head, a different letter being used each year. All the letters of the alphabet, excepting J, V, W, X, Y, Z, were used consecutively year by year in several styles, each cycle being

set in different shields so that any piece so stamped could readily be identified as to the year in which it was made.

In 1514 the mark of the lion was first established, and also the mark of the maker, which is an initial or some other emblem indicating the name of the maker as then registered in the guild hall. From this time on the lion became the mark of quality, and the leopard's head used with it attested to the fact that the mark was made at the London guild hall. In the same manner, an anchor instead of a leopard's head in conjunction with the lion shows that the piece of silver was made in Birmingham and registered at its local guild hall, while that made and registered in Sheffield has a crown instead of a leopard's head. The mark of the lion is the "Lion Passant." Previous to 1822, the head was turned outward, but since that date, it has been turned to the left.

A MUSICAL CANARY

A canary, owned by a musical family in London, demonstrates its extraordinary fondness for musical instruments



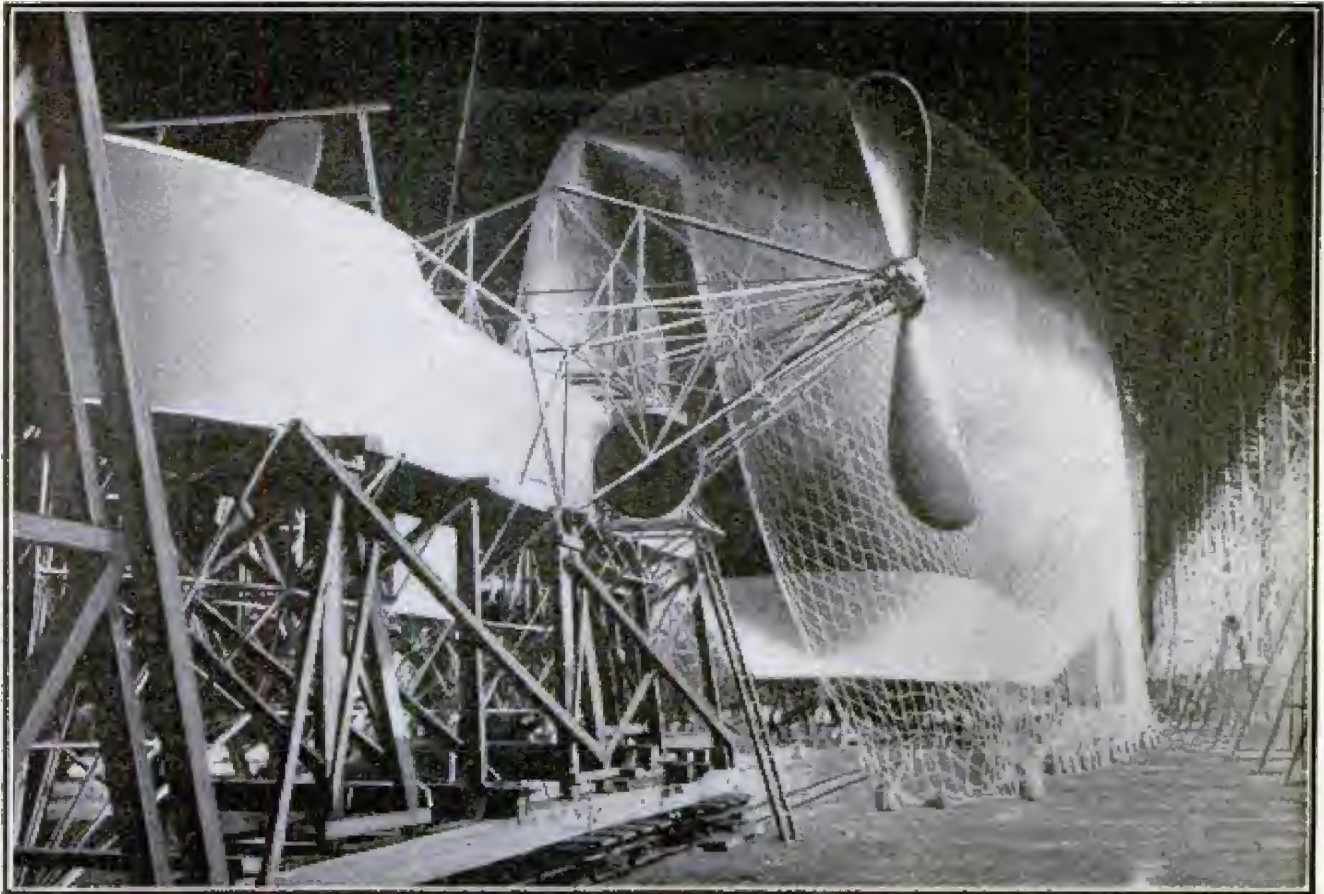
Courtesy Black & White, London

Listening Intently and Dodging the Fingers of the Player—Riding on the Bow of the Violin

whenever the instruments are being played. The bird's behavior is a source of constant amusement and interest. It flies to the keyboard every time the piano is played, where it dodges the player's fingers during the performance. When the violin is being played it clings to the bow, no matter how rapid the player's passages are.

LIQUID CONCAVE MIRROR FOR TELESCOPES

The most important part of a reflecting telescope is the mirror, which is usually a silver-coated reflecting bowl, ground and polished with great precision to an exact shape. This shape is the form assumed by the upper surface of a liquid held in a suitable container and rotated about a vertical axis. This fact has led scientists to propose the substitution of a revolving pool of mercury for the very expensive mirror of silver-coated glass or speculum metal, but, owing to the unsteadiness of the apparatus employed, the surface of the mercury rippled and was



The Gas Bag and Car of the "Captain Marchal," Presented to the French Army by Popular Subscription

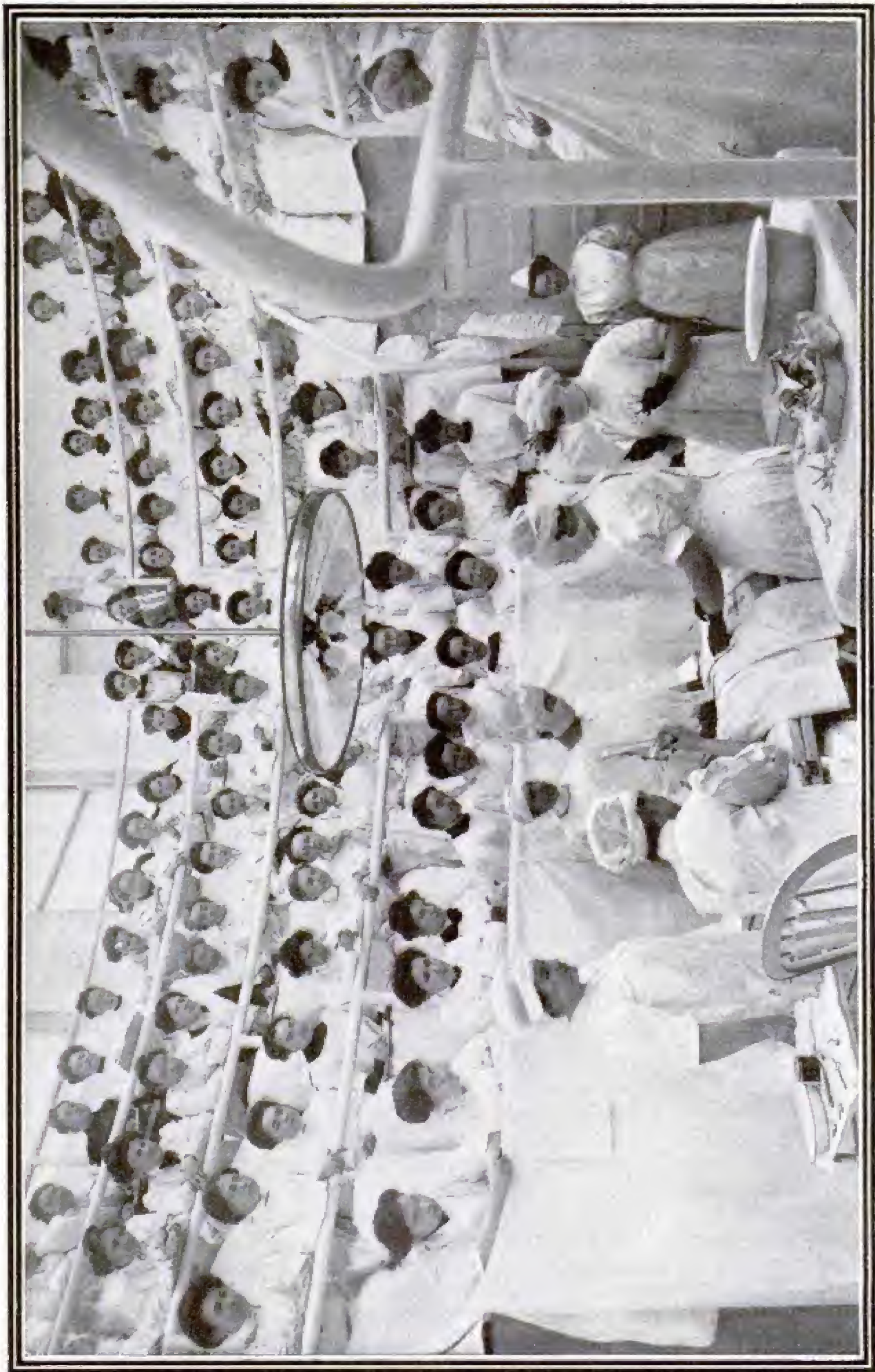
unsuitable for the purpose intended. Two physicists of the Philippine Bureau of Science have recently devised an apparatus by which this rippling action is eliminated. Instead of having one revolving vessel, three are employed, and a heavy, black paraffin oil is used instead of mercury. The vessels are of graduated diameters so as to fit one inside another, and are separated at the bottom central points by conical steel pivots. Oil is poured into each vessel to about one quarter of its depth, and the apparatus is rotated by a small electric motor. The innermost of the vessels is thus rotated by what is in effect a double, liquid friction drive, and all unsteadiness is absorbed by the liquid in the outer vessels. The curvature of the oil pool in the inner vessel can be altered at will by varying the speed of the motor, and in this way, a mirror of any desired focal length and magnifying power is obtainable.

This innovation is of the greatest importance to astronomers and scientists in general.

THE LATEST FRENCH ARMY DIRIGIBLE

The dirigible balloon, "Captain Marchal" which has been presented to the French army by popular subscription, and which will be placed in commission soon, will have two 60-hp. motors (Panhard-Levassor type), which can work coupled or separate, each driving both propellers, so that in the event of accident to one motor, the dirigible would be able to travel by the other. The volume of the great gas bag will be about 258,000 cu. ft. The suspended car, shown on a trestle in the illustration, is 29½ ft. long, and has a beam of 5¼ ft.

¶The general superintendent of the U. S. steamboat inspection service estimates that approximately one ten-thousandth of one per cent of the passengers and crews carried by vessels of all classes on all waters of the globe, lost their lives during the past year, the actual figures being 379 lost in a total of 328,666,000 persons.



SCENE IN WOMAN'S CLINIC DURING AN OPERATION



Medical Students in the Bacteriological Laboratory of the Woman's Medical College of Pennsylvania

SCENES IN A WOMAN'S MEDICAL COLLEGE

The new clinic in the hospital of the Woman's Medical College of Pennsylvania, equipped with every appliance and up-to-date accessory of the scientific operating room, is said to be one of the most perfectly appointed places of its kind in any woman's hospital in the world. One of the illustrations shows the appearance of this clinic during an operation. Not a man is present, the operating surgeons, nurses and attendants being women.

Woman students come to this woman's medical college from all over

the world. It is seldom that there is not at least one Chinese and two or three Japanese girls seeking the degree of M. D., and there are also girls from Turkey, Russia, Germany, France and many other countries. They come, graduate, and return to their native land to work among their fellow women. The majority of foreign students come from the Orient, where the woman physician is always popular. Many of the American girl graduates seek diplomas, intending to devote their lives to healing the physically ill in the eastern countries with a view to administering later to spiritual needs.

MOTORBOAT BUILT TO CROSS ATLANTIC

Capt. John Weller, a seaman and boat builder of Carlstadt, New Jersey, is to attempt to cross the Atlantic in a 50-ft. raised-cabin motorboat cruiser, which he has been constructing for the past several months. The little vessel is 50 ft. long, with a beam of 12 ft., and a draft of 3 ft. She is driven by a 37-hp. gasoline engine, which is expected to give a steady speed of a little

over 10 miles an hour. The deck is perfectly clear, except for a 3 by 4-ft. pilot house rising 14 in. above it.

The trip will be started from New York about July 15, and the run will be along the coast to Boston, thence to Halifax, Nova Scotia, and St. Johns, Newfoundland. The actual trip across the Atlantic starts at St. Johns, the course being between the two transat-



Raised-Cabin Motorboat with Which Captain Weller and a Crew of Seven Expect to Cross the Atlantic

lantic lines from Quebec and New York, the contemplated landing being Galway Bay, Ireland. Captain Weller expects to make the run of 1,677 miles from land to land in eight days. He will take a crew of six or seven

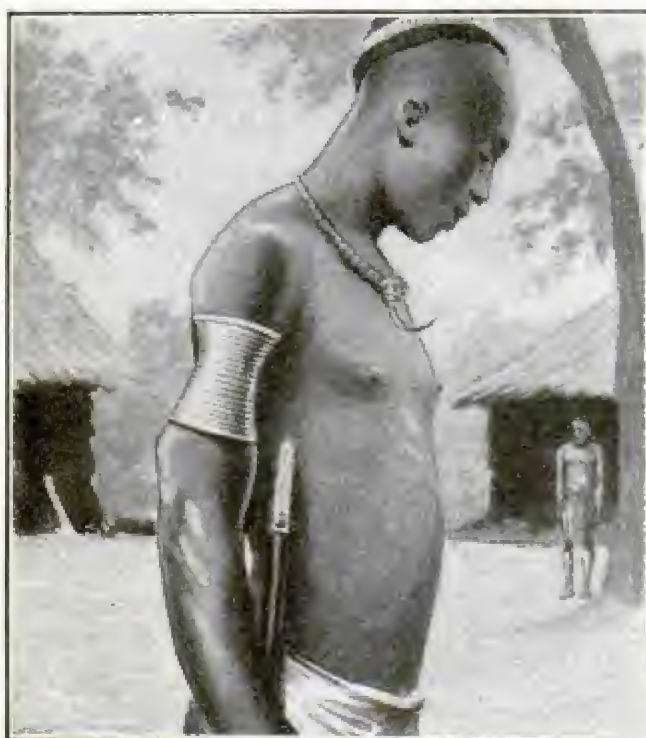


Captain Weller and Assistant at Work on the Interior Construction of His Transatlantic Motorboat

men with him, and sufficient provisions for two months. The fuel tanks, installed in the bow and sides of the boat, will be filled with 1,500 gal. of gasoline, about twice as much as Captain Weller expects to use.

MUSCLES FORCED OUT OF PLACE BY ORNAMENTS

One of the most remarkable and distorting ornaments worn by African tribes is the armlet of the Langos, a people who inhabit a country to the east of the Victoria Nile, and about three degrees north of the equator.



Remarkable Distortion of Muscle Caused by Armlet

These armlets are set on the upper part of the arm in youth, and, as the arms grow, force the muscles of the biceps out below them. In the example shown by the illustration, the girth at the point which should have been the broadest part of the biceps is only $8\frac{1}{2}$ in., while just below the elbow, it is 15 in.

NEW LARGEST VAULTS IN THE WORLD

Three vaults will soon be constructed by Uncle Sam in the Bureau of Engraving and Printing, which will be the largest in the world. The vaults are for paper money, printing plates, and postage and revenue stamps. Each will be 30 ft. long, 12 ft. high, and 30 ft. wide. The doors will be 3 ft. through, of alternate layers of chrome and bessemer steel, a combination that is held to be impregnable. To transfer the steel for the new vaults to Washington will require 300 freight cars. To build the three great safes will take nearly three years. The expense of installing them is estimated at about \$600,000.



Rear View of Curiously Shaped French Monoplane

FRENCH MONOPLANE OF UNIQUE SHAPE

A curiously-shaped French monoplane has made several successful test flights at Juvisy, France. It weighs 880 lb., is driven by a 50-hp. motor, and has a supporting area of 344 sq. ft. The machine has two vertical rudders, one being located on each side of the backward extending sections of the plane.



The Machine in Flight at Juvisy, France

BULLFIGHTING IN MEXICO

One of the illustrations shows one half of the Mexico City bull ring on a day when all attendance records were broken by a crowd of more than 40,000 persons. The "corrida," a parade of

the bull fighters is seen just entering the ring. Although 40,000 is the largest crowd ever recorded, crowds of from 25,000 to 35,000 attend every Sunday during the season, which is an



Half of the Mexico City Bull Ring on the Day All Records Were Broken by an Attendance of More Than 40,000 Persons



The Two Famous Bull Fighters Who Drew the Record Crowd

attendance much larger than even Saturday and Sunday baseball crowds in this country.

The two bull fighters who drew the record attendance are shown in the other photograph. The taller of the two is Antonio Fuentes, the most famous of Spanish matadors, and the smaller is Rodolfo Gaona, a popular idol of Mexico. Fuentes received \$8,000 for four fights in Mexico City, and in addition was given a benefit which netted \$12,000.

BERLIN'S TELEPHONE BUILDING

Berlin's new telephone exchange, claimed by Germany to be the largest installed under a single roof anywhere in the world, is housed in a building of unusual architectural beauty, in a prominent location. The



Berlin's Handsome New Telephone Exchange Building

exchange will serve 40,000 subscribers' lines terminating in its local switchboard, and big trunking and toll boards are provided for handling suburban and long-distance calls.

The local exchange equipment is situated in a magnificent hall, the natural lighting of which has been provided for by a long stretch of skylights on both sides of the center of the room, and windows spaced at frequent intervals back of the switchboards.

EXPECTED TO BE FASTEST BOAT IN WORLD

The 50-ft. hydroplane, built for the Duke of Westminster as a defender of the Grand Prix International Cup at Monte Carlo, is expected to prove the

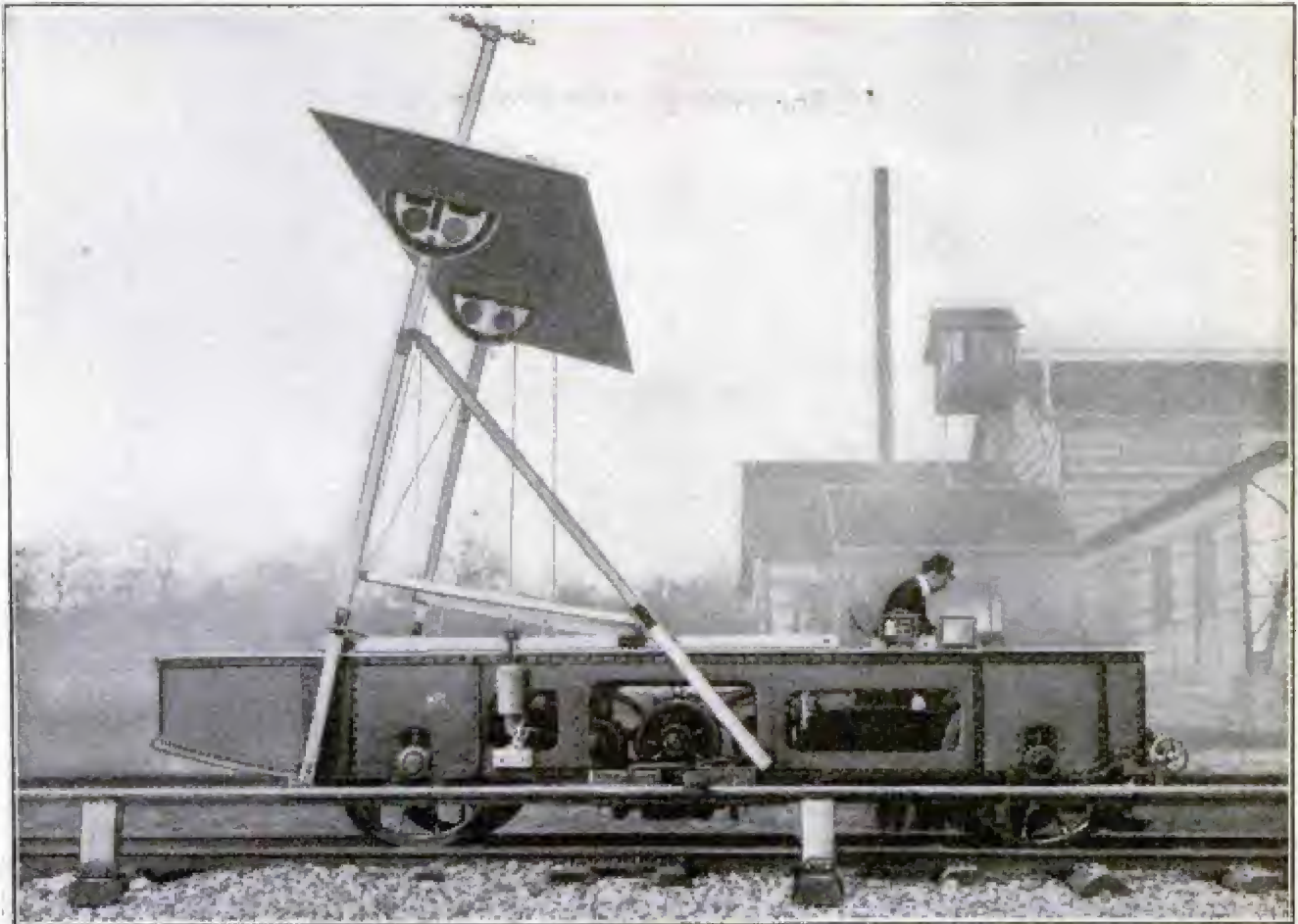


England's Defender of the Grand Prix International Cup

fastest boat in the world. She is named the "Bruneilde," and is designed to attain a speed of 40 knots (46 miles) an hour. The cup was won for the Duke of Westminster by the "Ursula," which at present holds the world's record for speed.

PHOTO GALLERY OF ARMY HORSES

Experiments are being conducted by the United States army with a view to establish a system of photographic identification for service horses. Specially constructed cameras are being used, by which two views of the same horse can be taken on one plate. By this system a colt will be photographed



Testing Wind Pressure and the Resistance of a Plane on a French Electric Aerial Experiment Car

when it is purchased by the government. The picture will be attached to the colt's identification papers and will be kept in its record wherever it is sent. The horse will also be photographed at different periods of its development, including the time when it is issued for service and when it is transferred from one organization to another. It is thought that these photographs will not only perfect a system of identification, but also will show the growth and development of the horse under different conditions. The claim is made that by a system of photographs, the merits of different kinds of forage also can be more accurately obtained.

AERIAL EXPERIMENT CAR

One of the most ingenious aerial experiment devices of the Aeronautical Institute at St. Cyr, near Paris, is an electric car designed for use in determining the resistance of any plane of a flying machine. The car runs on a

track 8,000 ft. long, and is provided with means for registering the speed of the wind as well as its own speed. The plane being tested is mounted on the supports as shown. These supports, as well as the plane itself, may be set at any angle.

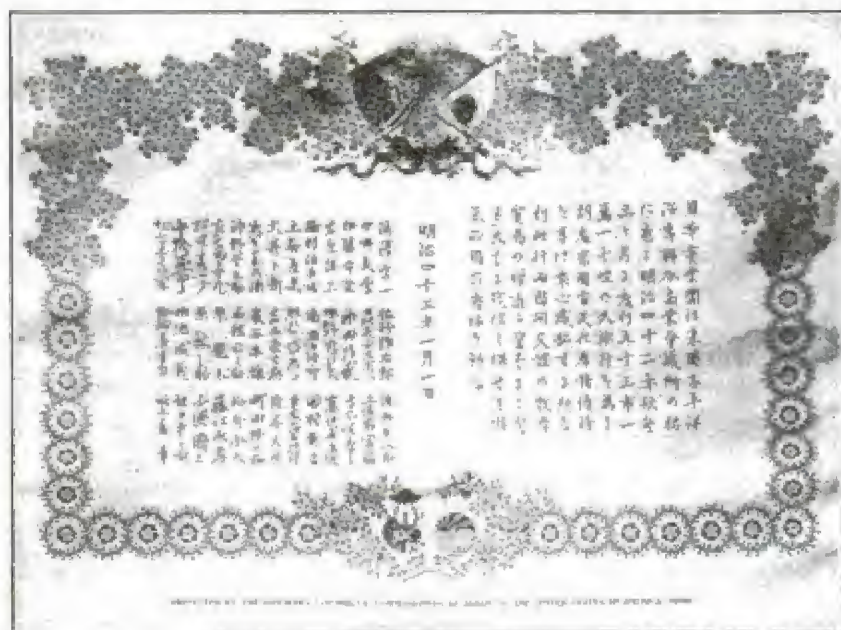
BAD CHURCH LIGHTING CAUSES SLEEPINESS

Very few churches, according to an illuminating engineer, are lighted in a satisfactory manner, the common mistake being an exposed light source, which becomes an irritant to the optic nerves. This frequently produces sleepiness, a great mental effort is required to remain awake, and the preacher is usually blamed instead of the direct lighting units.

¶The lives of every member of a London family were saved recently by a parrot which awakened everyone by cries of "Father, come quick!" when the building caught fire.

SILKEN NOTE OF THANKS

With a message of thanks and esteem woven in delicate colors on a handsome piece of tapestry the members of the Japanese commission which visited this country recently paid their compliments to the members of the Business Men's Club of Cincinnati and several other commercial bodies who entertained them. The tapestry is silk and the weaving has been done with infinite care. The inscriptions are all in Japanese characters and recite the



Message of Thanks Woven in Silk Sent by Japanese Commissioners to Their American Entertainers

pleasure the Japanese visitors had in this country and their indebtedness to the American business men who entertained them.

has elapsed from the date of the first award, M. Anzani will make it known whether or not the competition shall continue.

DE LESSEPS IS AWARDED \$10,000 PRIZE

Count De Lesseps, who was third in the aeroplane race from Belmont Park to the Statue of Liberty and return in the International Aviation Meet last fall, was declared the winner and awarded the \$10,000 prize, by the executive board of the Aero Club of America, on March 14. Both the late John B. Moisant and Claude Grahame-White were disqualified, the former because he had failed to make a previous flight of one hour, according to the conditions of the contest, and the latter because he fouled a pylon in rounding the course.

This decision settles a controversy which has lasted nearly five months, and gives to France the honor of winning one of the big events of the meet, Gra-

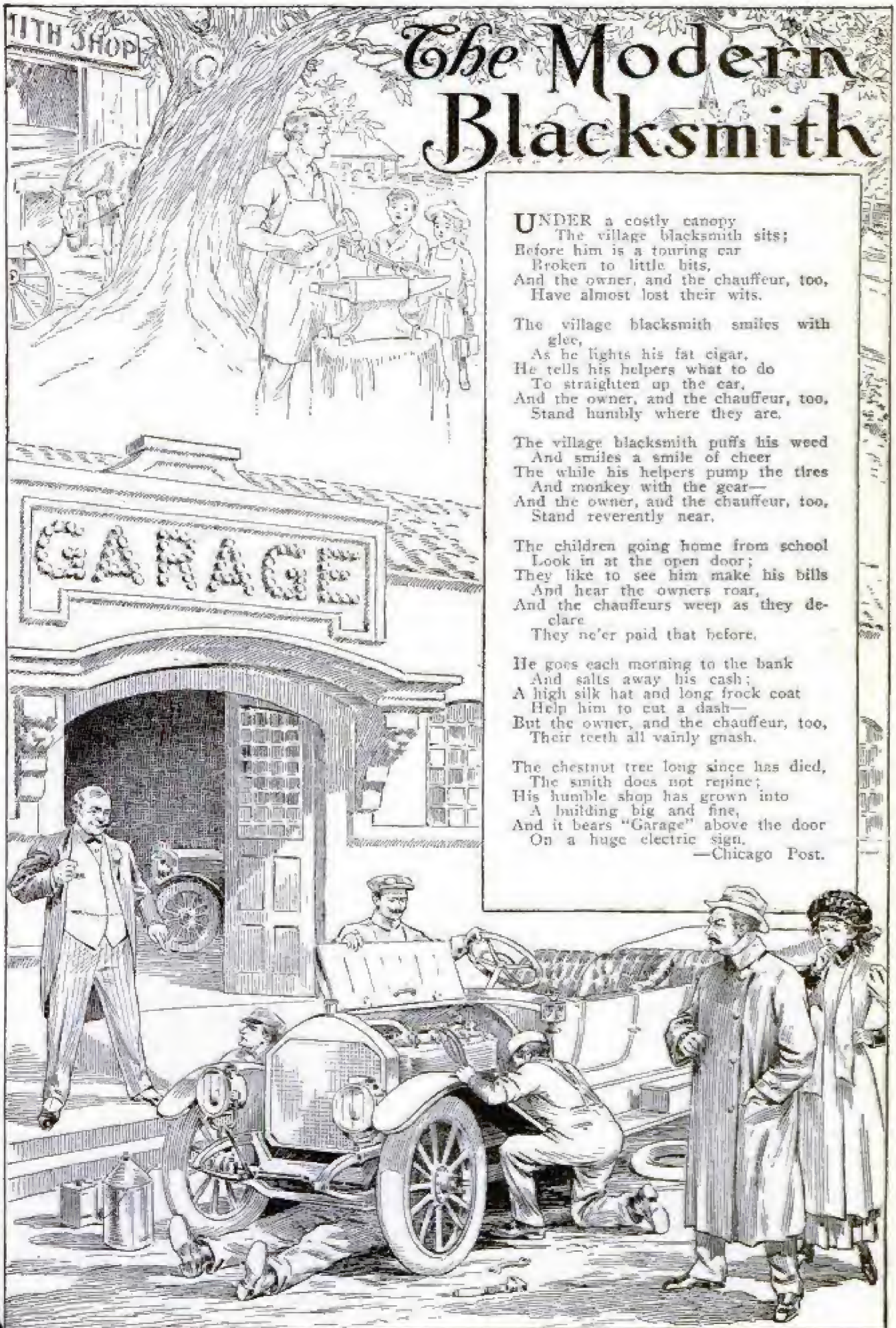
hame-White having won the grand speed prize for England and the late Ralph Johnstone the altitude prize for America.

NOVEL FRENCH AEROPLANE PRIZE

The French motor manufacturer, Anzani, has instituted a prize for an aeroplane flight from Paris to Orléans and return, which is a novelty of its kind. The prize consists of a gold medal, the award of which entitles the holder to collect daily at the offices of Mr. Anzani the sum of 20 francs (\$4) as long as he retains the prize, and no one may try to beat the holder's record for the purpose of winning the prize from him, unless he give two days' notice of his intention. After one year

ACID NOT ESSENTIAL IN RUSTING OF IRON

That acid of any kind is not an essential in causing iron to rust was recently proved by two English scientists. They also showed conclusively that when chemically pure iron was kept in contact with pure water even for many months, the iron did not rust. But when the slightest impurity was present, the iron was attacked very quickly, although not a trace of acid was present. Hitherto it had been supposed that rusting could not occur in the absence of an acid.



The Modern Blacksmith

UNDER a costly canopy
The village blacksmith sits;
Before him is a touring car
Broken to little bits,
And the owner, and the chauffeur, too,
Have almost lost their wits.

The village blacksmith smiles with
glee,
As he lights his fat cigar.
He tells his helpers what to do
To straighten up the car,
And the owner, and the chauffeur, too,
Stand humbly where they are.

The village blacksmith puffs his weed
And smiles a smile of cheer
The while his helpers pump the tires
And monkey with the gear—
And the owner, and the chauffeur, too,
Stand reverently near.

The children going home from school
Look in at the open door;
They like to see him make his bills
And hear the owners roar,
And the chauffeurs weep as they de-
clare
They ne'er paid that before.

He goes each morning to the bank
And salts away his cash;
A high silk hat and long frock coat
Help him to cut a dash—
But the owner, and the chauffeur, too,
Their teeth all vainly gnash.

The chestnut tree long since has died,
The smith does not repine;
His humble shop has grown into
A building big and fine,
And it bears "Garage" above the door
On a huge electric sign.
—Chicago Post.

BRITAIN'S NAVAL AIRSHIP

The first airship built for the British navy and now in commission is a huge craft with an outer envelope 512 ft.



The First Airship Constructed for the British Navy is a Craft 512 Ft. Long

long and 48 ft. in diameter. The framework is of "duralumin," which is one of the magnesium alloys of aluminum and the envelope is constructed of a

fire-resisting silk, the upper half of which is coated with aluminum dust to reflect the sun's rays. The two cars, each of which contains a powerful engine, one driving two propellers and the other one propeller, are boat-shaped and constructed of wood, so that they will float on the water. Three parallel horizontal planes on both sides, forward and aft, are utilized to raise and lower the craft, while lateral movement is obtained by three groups of vertical rudders. Lifting power is obtained by 20 balloons within the outer envelope.

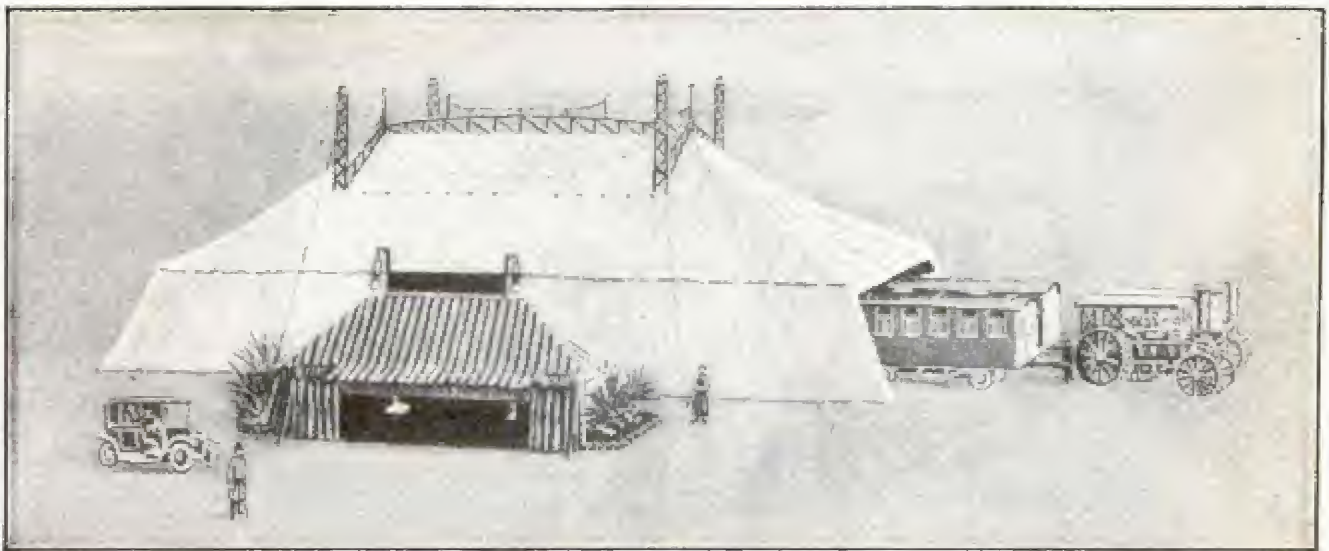
BOY AND GOAT CULTIVATE CORN FIELD

A 50-bushel yield of corn from an exceptionally rocky acre of land cultivated only an inch or two deep has drawn the attention of the U. S. Agricultural Department to the achievements of Earl Hopping, a 15-year-old boy of Rogers, Ark., and his billy goat. With the help of the goat, the boy hauled manure fertilizer to the field in a small packing-box cart, and then plowed the flint-rock-strewn ground with a little iron plow drawn by the goat.

The yield of 50 bushels of corn from



One of the Shocks of Corn, the Boy, Goat, and Plow which Cultivated the Field, and the Cart Used to Draw Fertilizer to It



Side Exterior View of Remarkable Traveling Theater Which is Transported from Town to Town in France in Cars Drawn by Traction Engines

this acre of rocky ground is one of the finest instances the Agricultural Department has to demonstrate the possibilities of shallow cultivation after careful preparation.

PARACHUTE EXPERIMENTS FROM EIFFEL TOWER

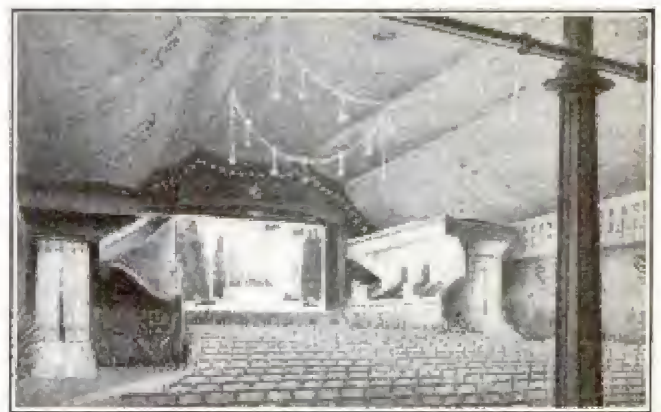
Successful tests of parachute safety devices for airmen were made recently from the Eiffel tower, Paris, under conditions as near as possible to those attending an actual fall of an aeroplane. A stuffed dummy of the average weight of a man was attached to the parachute and the whole placed in an aeroplane frame in the position the operator would occupy. Then the tackle from which the framework was suspended was cut. In all the tests the parachute and dummy cleared the framework and dropped slowly to the ground, while the framework was completely smashed.

FRENCH TRAVELING THEATER

By a remarkably ingenious assembling, the manager of a Parisian theatrical troupe sends his company and a portable theater to the provincial cities and towns of France each summer in 21 specially constructed cars drawn by eight traction engines.

Besides the theater tent, which is supported by towers and girders after the fashion of airship hangars, the

equipment consists of knock-down structural material for the stage, scenery, theater chairs, dressing rooms and an electric plant. Two cars are provided for the transportation of the performers, one for the women and the other for the men; a car for the costumes, and two large cars, which, placed one on each side of the stage, constitute box seats. The two trains

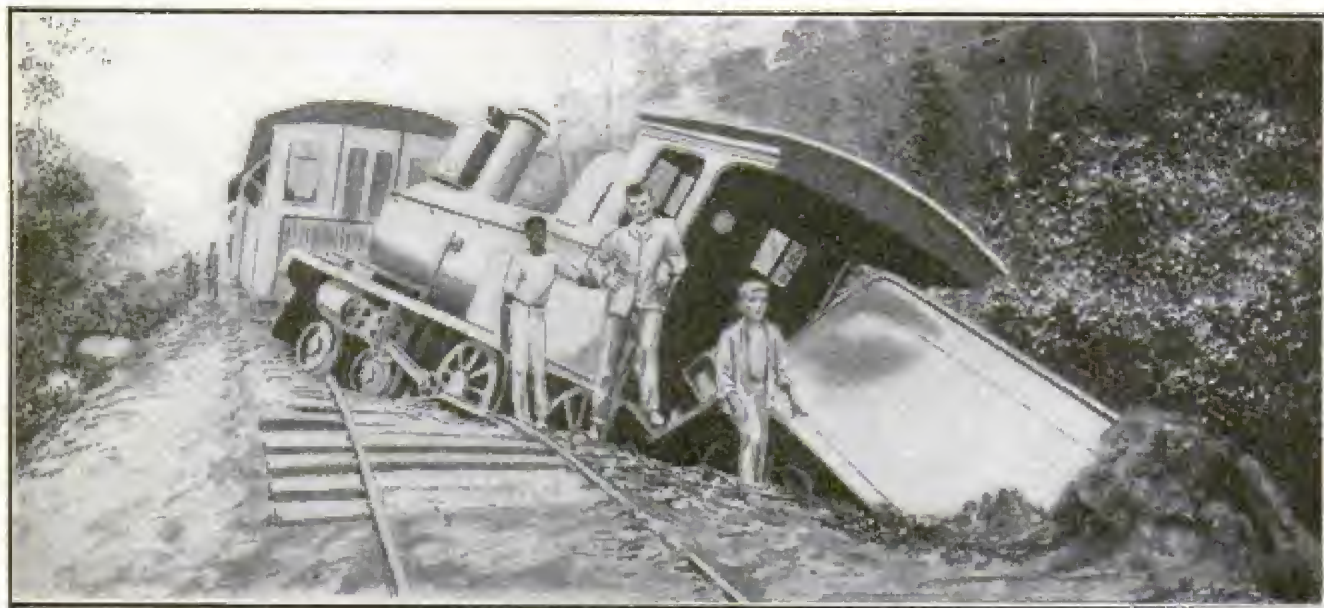


Interior of Theater Showing Arrangement of Stage and Seats, and Two of the Cars Converted into Boxes

drawn up in the rear of the stage, partially under the tent, contain the dressing rooms. The entrance to the theater is on the side.

¶ In spite of the fact that cottonseed meal does not agree with pigs, G. S. Fraps, a government experimenter, does not believe that cottonseed food products would prove harmful to man, provided a sufficient amount of other food containing little or no protein were eaten at the same meal.

TRAIN WRECKED BY WILD ELEPHANT



Derailed by Collision with Wild Elephant on the Malay Peninsula

Among the photographs published in the last official report of the Federated Malay States Railways were the two remarkable ones here illustrated, showing the wreck of a passenger train and the wild elephant which caused it.



The Elephant Got the Worst of It

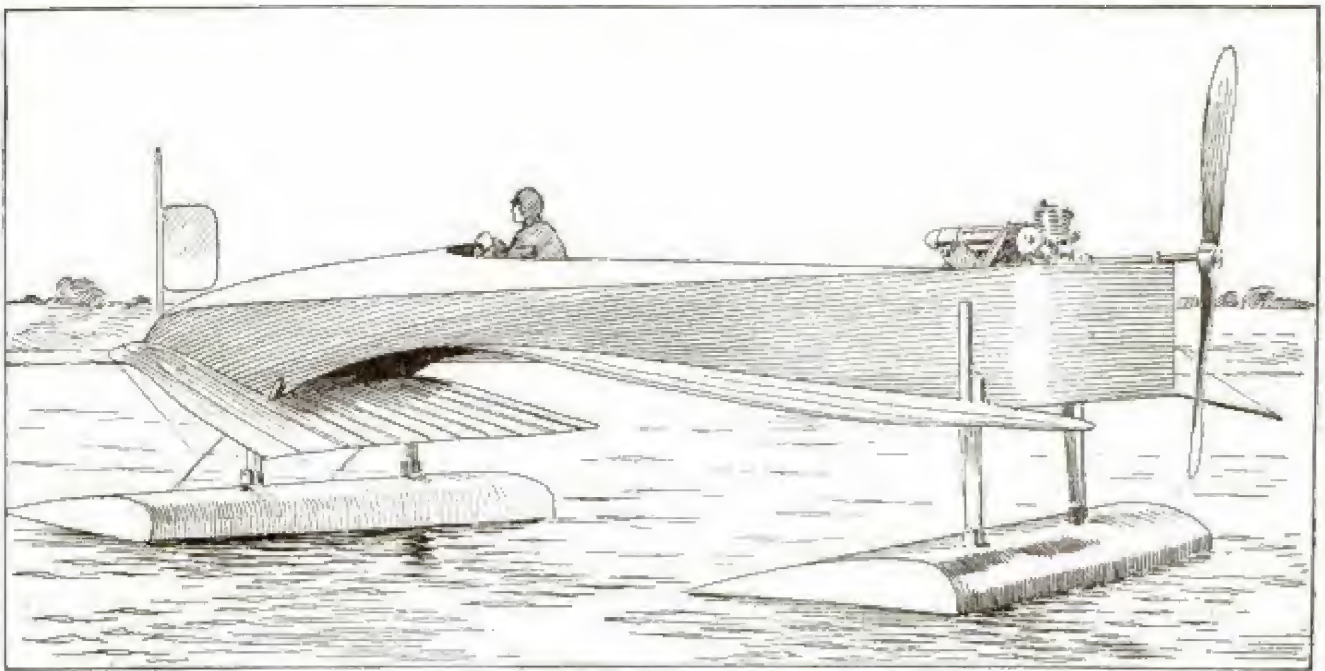
The huge animal, apparently frightened by the noise of the approaching train, started to

cross the track and was struck by the engine. The force of the impact was sufficient to throw the engine and tender from the tracks in the position shown by one of the illustrations. The elephant was almost instantly killed by the force of the blow and thrown into a ditch on one side of the roadbed.

AERO-HYDROPLANES BUILT IN UNITED STATES AND ENGLAND SIMULTANEOUSLY

Two curious machines, half aeroplane, half water craft, have been built in America and England. The European machine, designed by a French airman, was built by an English firm at East Cowes for the Monaco motorboat races, and consists of two hydroplane floats, each about 20 ft. long, hinged to

supports carrying a boat-shaped body. The aerial propeller is driven direct by a 50-hp. rotary engine, located at the stern of the raised body. The aerial steering rudder is over the bow of the raised body, and is controlled from the driver's seat by a steering wheel. Two planes, designed to provide vertical



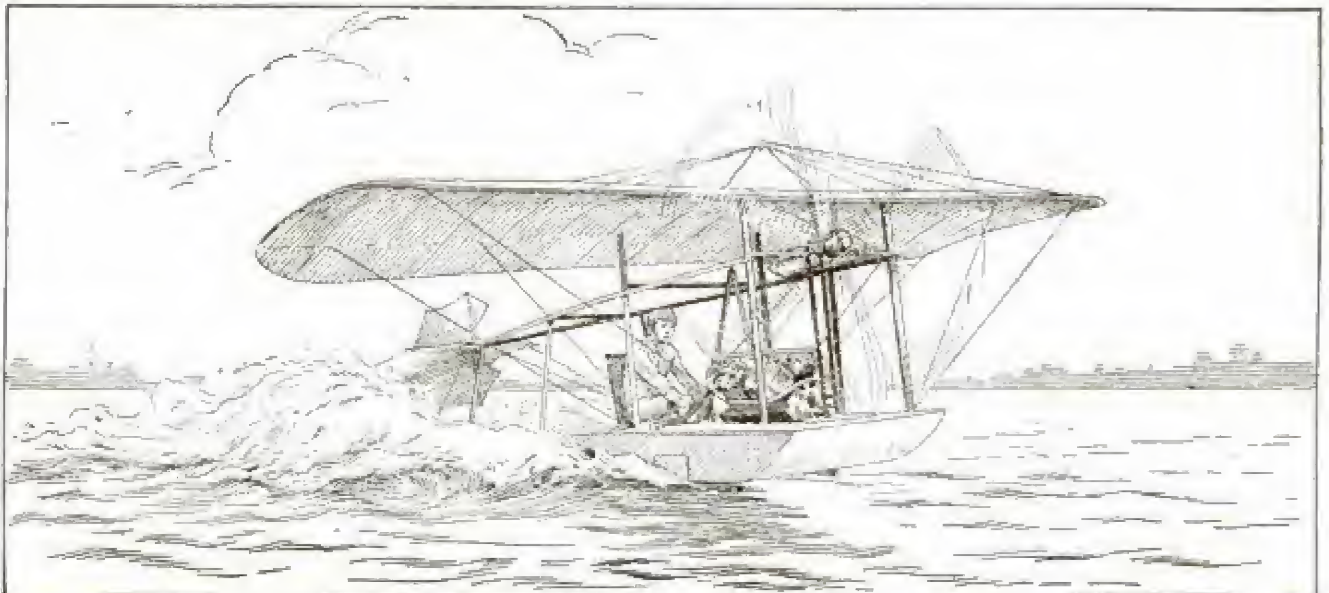
Aero-Hydroplane Built to Compete in the Monaco Motorboat Races

stability, run from amidships to the stern, one on each side of the body, and a third plane, triangular-shaped, is arranged under the bow for the same purpose. The floats skim lightly over the top of the water.

The American machine, carrying out in a different form the same idea as shown in the European aero-hydroplane, has attained a speed of over 60 miles an hour on the Detroit River. This machine, which was built by a Detroit boat concern, is appropriately called the "Flying Fish," as it skims over the water, barely touching it. The hull is a watertight aluminum tank, 5 ft. 7 in. wide, 7 ft. 2 in. long, and 2 ft.

deep. In the front of the hull is an 8-cylinder aeroplane motor, which drives an 8-ft. aerial propeller at high speed. Above the hull is a single plane, 26 ft. by 6½ ft., and on a framework back of this is an aerial rudder.

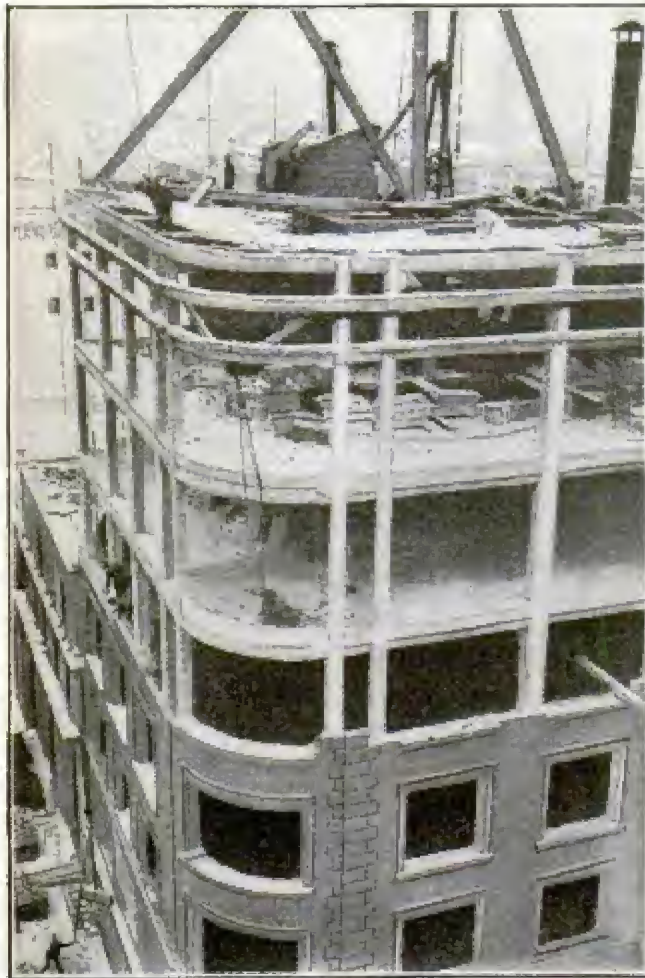
When sufficient speed is attained to lift the hull completely out of the water, it rides upon its tail, which is a flat board, 5 ft. 7 in. long and 1 ft. wide, fastened to arms extending several feet back of the hull. The rush of air against the plane at times lifts the craft several feet above the surface of the water, but the tail board, however, is always in the water and controls the equilibrium.



A Craft That Flies Over the Water with Only Its Tail Submerged

RAZING CONCRETE STRUCTURE A DIFFICULT TASK

By STUART S. SCOTT



Removing the Facade of Second Largest Concrete Building

With pneumatic drills, oxygen blowpipes, sledge hammers and dynamite, the second largest concrete building in the United States is being torn down in Baltimore to make room for a skyscraper of the steel skeleton type. The building being razed is the Baltimore News Building which was erected in 1905, following the great conflagration, and with its nine stories from foundation to roof and its floor area of 57 ft. by 78 ft., it was at that time the most extensive reinforced concrete structure that had ever been attempted.

Built on a percentage basis and designed to carry the weight of linotypes and a composing room on the sixth floor, great care was exercised in making the framework substantial. To this end all of the outer edge columns were made 14 in. square, while the

inner columns were 18 in. square. The beams varied in size from the main stringers through the center, which were 18 in. by 40 in., to 14 in. square.

Through these beams are interlaced hundreds of tons of steel bars, ranging from slender tie-rods to 2-in. rods, all interlaced to form a solid mass of metal and concrete.

When it was proposed to raze the structure, bids were requested, but, to the surprise of the owner, the contractors not only wanted the entire building but bonuses ranging from \$40,000 to \$90,000. The company which has the contract for the erection of the new building then agreed to wreck the structure at cost and give the salvage to the owner. It is estimated that the wrecking will cost \$30,000 exclusive of what the salvage will bring.

It is expected that the work of razing will require 90 days. With pneumatic drills, the concrete is chipped away from the columns and beams and the steel rods are exposed. The rods are then cut with the blowpipe. The sections thus taken out are being sent to a salvage firm that, with a drop-weight, is crushing the cement from the rods.

Drop-weights were tried upon the floors of the building, but they were ineffective, so gangs of negroes with sledges are employed to knock the concrete out, the blowpipe then cutting out the rods.

In the basement, where are the foundations upon which the press stood, dynamite, in small charges, is being used with success. This explosive, however, can only be used at night. During the day the work is carried on by a gang with sledges and drills, much the same as quarrying is done.

ⒸAn oil having a higher explosive quality than gasoline is being extracted from the waste gases of coke ovens at Dunbar, Pa.

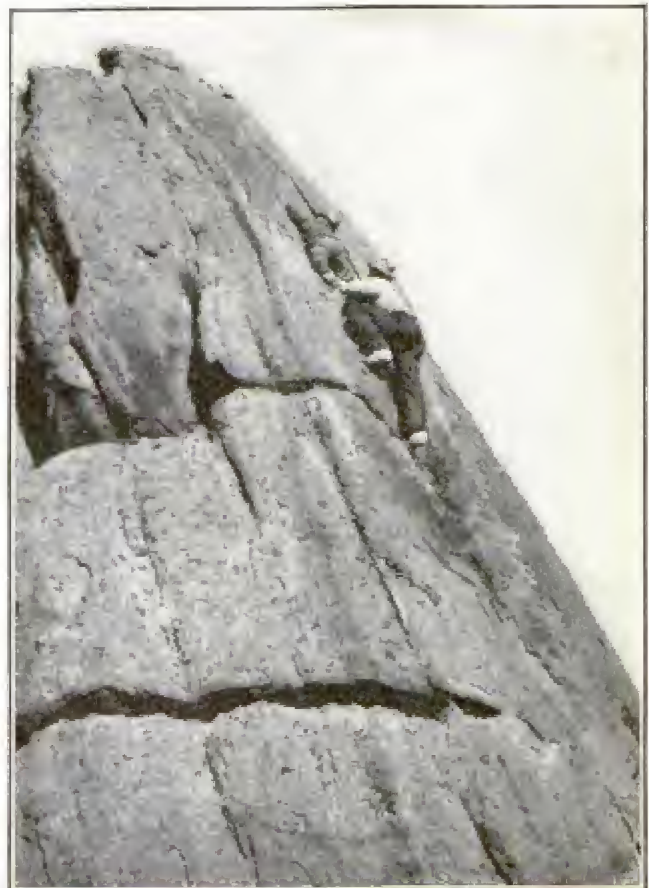


Photograph of a Mountain Climber in Colorado Just as He Leaped from One Rocky Shelf to Another

MOUNTAIN CLIMBER NEEDS AGILITY OF A GOAT

The mountain goat can hardly outdo the students of the University of Colorado, at least so far as pictorial effect is concerned, when a leap from one crag or shelf to another is to be accomplished. It would seem also that the young men are making ready to qualify as human flies, according to photographs recently made of a party of students who were doing a few mountain climbing feats for exercise. Near Boulder, Colorado, there are five or six very precipitous peaks known as "The Flatirons." Some of them have never been scaled and great fame awaits the student of the University of Colorado who will be the first to climb and affix the University "C" to the highest of these. The feat is yet to be accomplished, although it has been attempted time and again. The peaks are about 30 miles from Denver and on a recent trip of a party of the students, in addition to climbing some of the heights that have never before been reached by man, some remarkable photographs were made of the climbers. One of these shows a member of the party in midair just as he was leaping from one

shelving rock platform to another. A second photograph shows a line of climbers going up the side of a rock that seems almost perpendicular.



Men Climbing the Rocky Mountains in Colorado Seem to Have the Powers of Flies

LIZARDS PHOTOGRAPHED WHILE FIGHTING

In this part of the world lizards are small, inoffensive reptiles, fond of bask-



A Battle between Giant Lizards in Australia

ing in the sun; but in Australia, the monitors, which are reptiles nearly allied to the true lizards, often reach a length of 6 ft. These lizards, of a greenish-gray color, are very active, and defend themselves vigorously when attacked.

An encounter between two giant monitors in the rocky bottom of a ravine was recently watched by a hunter, who approached within a few feet of the battle and photographed them without being noticed, so absorbed were they in the fight. Sometimes the huge reptiles raised themselves on their tails and grappled like wrestlers, then rolled on the ground and bit ferociously.

RAILWAY BRIDGE OVER PANAMA CANAL

Plans are being prepared for a great steel bridge over the Panama Canal at Empire to accommodate both the Panama Railway and roadway traffic. The bridge, which will probably be of the steel arch type, will require a span of approximately 500 ft., in order to se-

cure the required clearance height of 175 ft. above the entire width of the canal. Difficulties in securing a good foundation for the abutments may necessitate an even longer span.

The new bridge will be located near the present suspension bridge, which is a temporary structure built two years ago. This bridge is ample for light roadway traffic but cannot carry railroad trains. The plans for the new bridge provide for a 16-ft. railway width, a 16-ft. highway width, and footwalks.

SPECIAL AUTOMOBILE FOR LAMP TRIMMERS

Automobiles of novel construction are being used by the "trimmers" of electric street lamps in Philadelphia as a means of increasing the speed of the work. In a test run, one man cleaned and inserted new carbons in 165 lamps in six hours. The unique features of the "trimmers' truck" are the elevated driving seat and the extended steering wheel and controls. A driving seat is also provided in the usual position, as well as a second set of wheels for use



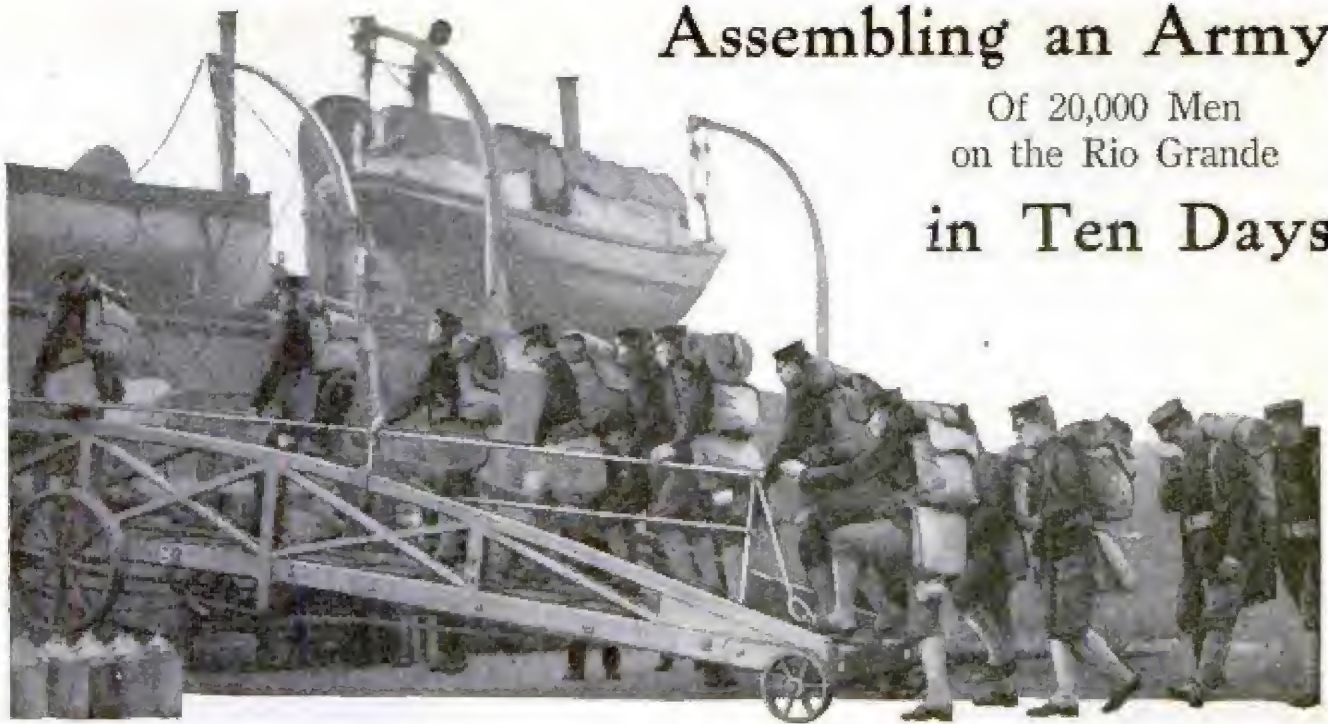
One Man Cleaned and Inserted New Carbons in 165 Lamps in Six Hours with This "Trimmers' Truck"

when steering and controlling the machine from this seat.

Assembling an Army

Of 20,000 Men
on the Rio Grande

in Ten Days



U. S. Marines Boarding a Transport for the South

How Magnificent Organization Made Possible the Gathering of Widely Scattered Units into a Single, Completely Equipped Fighting Force, Ready for Instant Action

By L. WILLIAM THAVIS

NEVER before in the history of this country was so large a body of troops mobilized at one point in so short a time as was taken in establishing the maneuver camp at San Antonio, Texas. Orders for the movement of the troops were issued from the War Department during the afternoon of March 6. The 17th Infantry, stationed at Fort McPherson, Ga., was the first organization to receive its orders at 9:30 that night. By 4 p. m., March 16, just 10 days later, an army numbering practically 20,000 was encamped about the Texas city.

That such a seemingly impossible feat as this could be accomplished in so short a period is due, according to General Leonard Wood, Chief-of-Staff of the army, to the theoretical training which army officers now receive at the War College in Washington and also to the practical training they have

had in the movement of troops to and from the Philippines.

When this country declared war with Spain, practically two months had elapsed before a body of troops of any appreciable size had been mobilized at any one point, and this was only done after the greatest confusion and turmoil. The recent movement of troops was accomplished without the slightest bit of excitement; and 36 hours after the determination was reached to mobilize a whole army division in Texas, the officials of the War Department were sitting tranquilly at their desks watching with quiet interest the workings of the magnificent machinery that had been so carefully built up to respond to just such an emergency as the present.

There was good reason for this, for every detail of the movement had been worked out with the great-



Major General Leonard Wood, Chief of Staff and Ranking Officer of the U. S. Army



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Aeroplane in Flight with Lieut. Foulois over the Camp at San Antonio



Photograph by Underwood and Underwood

Shelter Tent Camp of the 15th U. S. Infantry. The Tents of the 11th U. S. Cavalry in the Background



Photograph by Underwood and Underwood

Supplies Being Loaded at the League Island Navy Yard, Philadelphia, for Troops and Sailors Engaged in the Maneuvers



Extreme Left of Insurrecto Line, Showing Smelter on American Side of Rio Grande

est perfection long in advance, and there was not an officer concerned who had not taken part in other movements of less scale. The management of the United States army is no longer a matter of guesswork, but a highly scientific undertaking.

At the War College in Washington, the mobilization of just such bodies of troops as those now encamped about San Antonio is one of the chief studies of



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Types of Insurrecto and Mexican Federal Soldiers Engaged in Conflict

the course. Even the smallest detail in connection with such an undertaking is not overlooked. Plans are prepared for the mobilization of forces about practically every large city in the country. Every particle of information that might be needed in the preparation of these plans is at hand at the War College, so that nothing need be left to guesswork. When once one of these mobilization plans has been completed



Citizens of El Paso, Tex., Watching Battle Two Miles Above Juarez

by the officers under instruction at the institution and approved by those in authority, it is filed away for future reference. Included in the work of the War College there is the collection, arrangement and publication of historical, statistical and geographical information; war maps, American and foreign; general information regarding foreign armies and fortresses; and collation and discussion of all obtainable data relating to strategical, tactical and logistic features of future military operations and formation of complete working plans for passing from state of peace to state of war. With such an arrangement, every possible bit of assistance is given the army officers when the time comes to order troops into the field.

When once there has been issued such an order as the one that brought 20,000 troops to San Antonio, the greatest amount of work then falls on the commissary and quartermaster departments. At the San Antonio camp, the problem of feeding 20,000 men is no easy task, although carried on in this particular instance under the most favorable conditions. In estimating the amount of food necessary to feed an army, the unit of measure used is known as a ration, or that amount of food required by one man for one day. One army ration costs the government about $23\frac{1}{2}$ cents at the present time. Several years ago it could be purchased at several cents less cost. The 20,000 rations needed to feed the army one day cost the government \$4,704 and require the services of 312 cooks and as many assistants in its preparation.

In a camp of this size, some of the items of food consumed each day are 28,000 lb. of beef, 200 lb. of dried and canned fish, 1,000 lb. of lard and 600 lb. of butter, 1,700 lb. of coffee, 2,000 cans of condensed milk and 6,000 lb. of sugar. Between 30,000 and 40,000 loaves of bread also must be included.

If the regiments camped about San Antonio were to be ordered in the field for a week of active campaigning, it would be necessary to carry along 45,-

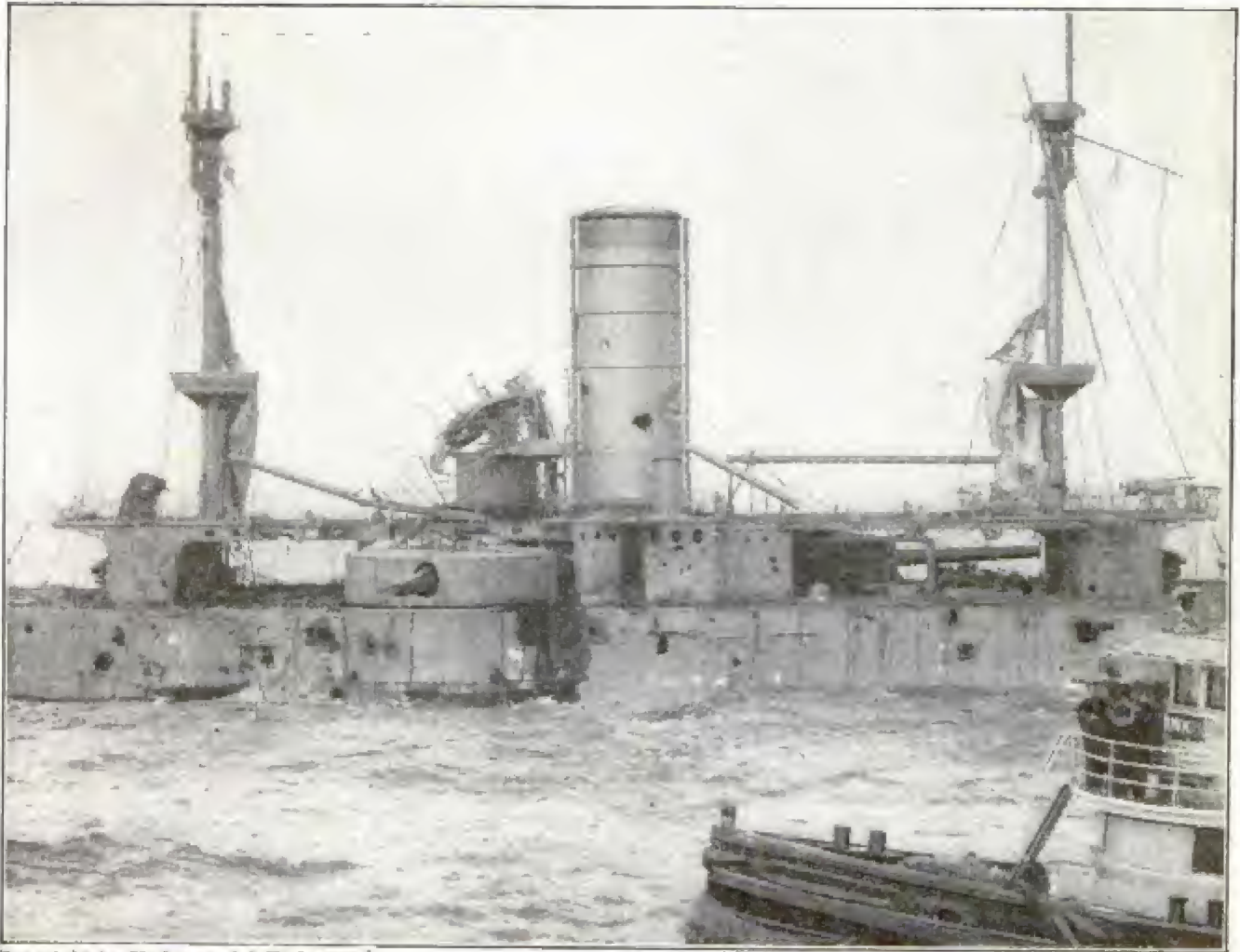
000 lb. of canned beef, 78,750 lb. of bacon, and 150,000 lb. of bread. Other items would be 30,000 lb. of desiccated onions and potatoes, 15,000 lb. of canned tomatoes, 12,000 lb. of coffee, 22,250 lb. of beans, 13,125 lb. of jam, 375 lb. of pepper, 6,000 lb. of salt, 13,500 lb. of vinegar, 6,000 lb. of soap and 2,850 lb. of candles.

When such enormous weights as these are considered, it is no wonder that the quartermaster's branch of an army division numbering 20,000 should have to provide 1,400 draft horses and 3,696 draft and pack mules to haul the 1,008 wagons necessary, not to mention 48 ambulances. Besides carrying this great amount of food, these wagons must also haul the 4,500 tents required to provide shelter for the troops. No less than 128,000 lb. of hay and 10,000 lb. of oats are required each day to feed the horses and mules. Among other items picked at random from a long list are 1,078 brooms, 980 buckets, 1,168 garbage cans, 1,530 cases of axle grease. One rather unusual item is 92 pairs of handcuffs.

These figures are but a few of those that have been filed away in the War Department as the result of the investigations made at the War College and in other branches of the service. They represent the outcome of investigation work dating back as far as 15 years. No doubt many of them will be modified and changed somewhat during the next year, for it is the intention of the commanding officers of the army to use the present maneuvers about San Antonio as a test for their calculations.

HOTEL BURNED WHILE CROSSING ICE

Bungalow Inn, a small summer hotel on Lake Cobbosseecontee, Maine, burned recently under unusual circumstances. The proprietor of the hotel decided to move it from its island location to the mainland, and when it had been dragged half way across the lake on the ice, it caught fire in the night and burned with all its furnishings.



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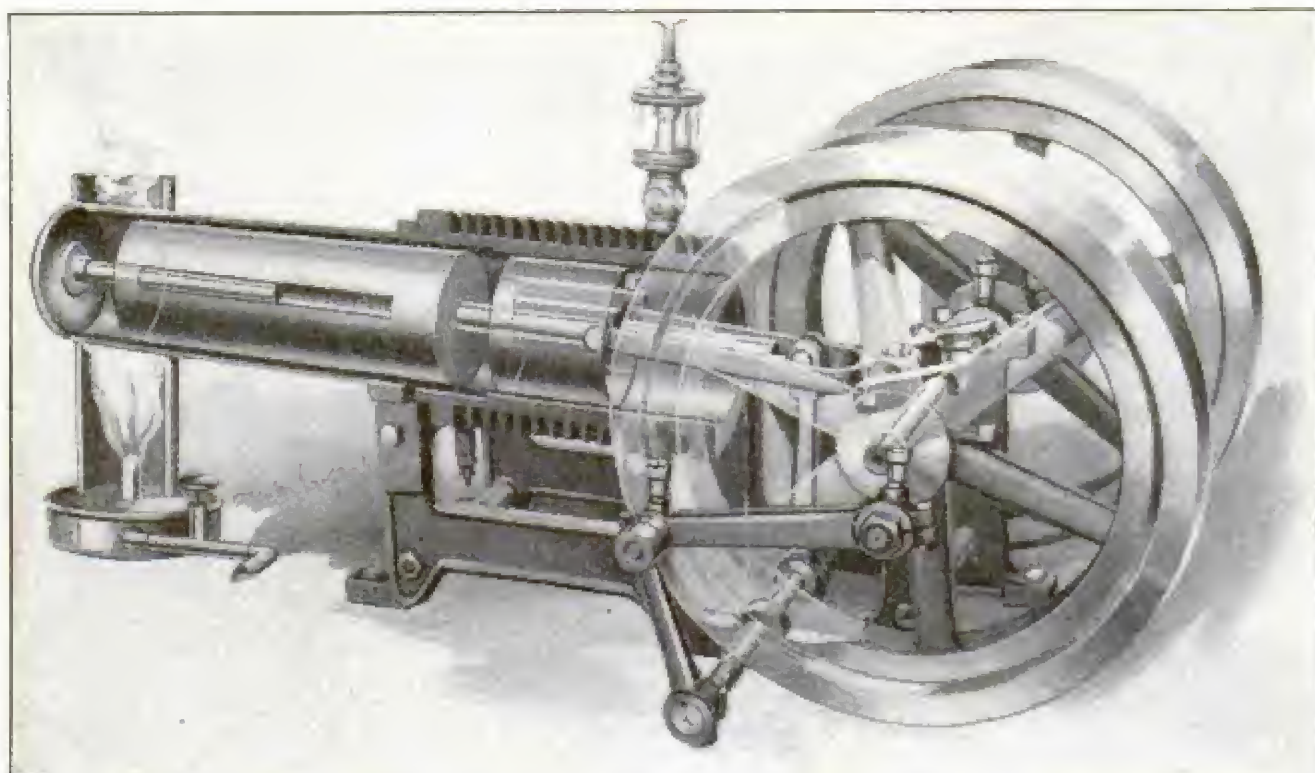
A View of the Port Side of the Target Battleship "San Marcos," after She Had Been Riddled by the Guns of the "New Hampshire"

TARGET BATTLESHIP RIDDLED BY NAVAL GUNNERS

A rooster and a cat have earned places on the honor rolls of the navy as a result of their having lived through a hail of shot and shell from a modern battleship's big guns when the "New Hampshire" of the Atlantic fleet, tested the effect of its batteries against the condemned battleship "San Marcos" in the Chesapeake Bay, March 21, and sank her. The "San Marcos," before becoming a target for naval ordnance, was known as the second-class battleship "Texas" and was for many years the "hoodoo" ship of the navy. The cat and the rooster were placed aboard the ship to discover the effect of the gases and shock on living things. Both came through the ordeal in better shape than the ship, although the rooster will go through life with but one leg, the other having been sacrificed in the performance of his hazardous duty.

The "San Marcos" was literally shot to pieces by the gunners of the "New Hampshire." A number of shots were fired at the target from a distance of seven miles. Most of them went home and great jagged holes were found in the heavy modern armor in vulnerable parts of the ship. These were plugged up to keep the ship from sinking until the test could be completed with the firing of broadsides, at a medium range. The effects of the latter were sufficient to completely wreck the old vessel, and leave her in a sinking condition.

ⒸThe harem skirt is doomed in Atlanta, Ga., if a proposed city ordinance passes the council. In this bill the new garment is stigmatized as "violative of convention" and "provocative of riot."



Cross-Section and Phantom View of New Type of Hot-Air Engine That Promises to Rival Other Types of Fractional-Horsepower Motors

A HOT-AIR ENGINE THAT NEEDS NO WATER COOLING

Like many another notable discovery, an accidental circumstance was responsible for the invention of this hot-air engine, the wonderful performance of which, for its type of engine, has converted several well known engineers from skeptics into admirers.

In the accompanying illustration, the cylinder is given in section and some other parts are "phantomed" to show the mechanical connections. There are two pistons. The smaller one fits snugly in the cylinder and is connected direct to the engine crankshaft by a forked pitman or connecting rod. The larger piston, which has a small clearance between it and the cylinder walls, is guided horizontally by the fixed cylindrical rod secured to the cylinder cover at the extreme left, and also by the piston rod which slides through a central bore in the smaller piston. This piston rod is pivoted at its other end to a short link which in turn is jointed to a rocking lever rigidly secured at its lower end to the horizontal rockshaft which runs in transverse bearings formed in the

engine bedplate. The near end (in front of the picture) of this rockshaft is rigidly keyed to another rocking lever which is pivoted to a connecting rod cranked to the flywheel in front. A glance at the cut will show this quite clearly.

The action of the engine is as follows: At the beginning of the working stroke, the pistons are both together at the left end of the cylinder. The expansion of the air forces them forward. A short distance from the starting point, the forward (small) piston pulls quickly away from the other, forming a partial vacuum (between the pistons) into which the heated air can rush (around the loosely fitting large piston) and expand. After this expansion, while both pistons are going forward, the pistons come together again. The expansion of the air cools it quickly and effectively, and a water jacket or cooling system, which is indispensable in other types of hot-air engines, is thus rendered unnecessary.

The engine, being of a nonexplosive

type, needs no spark plugs, batteries, carburetors, etc. Its fuel cost is said to be less than one cent an hour, for gas or kerosene, and it is so simple that a woman or child can run and op-

erate it. It seems to be well adapted for running small lathes, grinders, drills, cream separators, washing machines, pumps, domestic lighting plants, etc.

STOPPING A RIVER TO SINK A TUNNEL

A modern parallel to Joshua's miracle of old was furnished in the stopping of the flow of the Chicago River while the twin tube for the La Salle Street tunnel of the Chicago street railway system was being sunk into place. This precaution was necessary as the enormous tube, which is 278 ft. long and 41 ft. in width, would otherwise have dammed up the river, probably resulting in a displacement of the tunnel and serious damage to the bridges and shipping of Chicago's busy waterway.

Each of the tubes forms three-quarters of a cylinder of circular section, 24 ft. in diameter. Within the tubes there is a reinforced concrete lining varying from 20 to 40 in. thick, while the middle concrete wall is 3 ft. thick. The trench for the tunnel was made by dredging.

The flow of the Chicago River was stopped temporarily by closing the



Erecting the Steelwork for the La Salle Street Tunnel, Chicago

locks at Lockport while the tube was being towed to its site and sunk into position.



The Tunnel Lying Afloat and Nearly Submerged in the Chicago River, at Right Angles to Its Site. The Upstanding End Portions Are Caissons for Use in Joining Tunnel to Its Approaches



How the Bodies of Victims Were Taken from the Shirtwaist Factory after Tragic Fire



Many of the 141 Persons Killed in the Fire Jumped from the Top Stories of This Building

RIGID INSPECTION RESULT OF NEW YORK FIRE

As has always been the case after a great fire in which many lives were lost, the factory fire in New York, in which 141 workers, all but 16 of whom were girls, suffered a horrible death, resulted in a rigid inspection of buildings in many cities of the country. This inspection found, as did previous inspections, that there were hundreds

of buildings in New York, Chicago, and other cities where the workers are just as poorly safeguarded as in the fatal shirtwaist factory.

The great majority of the dead ended their lives by jumping or being pushed from the windows of the burning building. Sixty-three bodies were picked up from the sidewalk, 50 were found on the ninth floor of the building behind barriers they could not pass, and 30 bodies were found at the bottom of the elevator shaft.

The fire-escape equipment was totally inadequate, and investigation brought to light the fact that the doors providing exit from the floor from which the death list was greatest were kept locked during working hours so that the hundreds of workers could not indulge in petty thievery. The subsequent inspection has brought to light many buildings where the same conditions exist.



Hole Made in Iron and Glass Sidewalk by Bodies Falling from Top Floors of Building

COMMENT AND REVIEW

THE Pan-American Congress recently held in the new building at Washington, dedicated to the promotion of closer relations between the twenty-one western republics represented, was as notable as in many respects it was unusual.

The Pan-American Congress

Ambassadors, ministers, consuls general, business experts, manufacturers, and other interested delegates to the number of over 1,200, were present. The sessions started at 9 A. M., and continued until 10 P. M., with brief recesses at noon and evening, for six consecutive days, and not a minute was wasted. A full month could have been profitably employed, for, as one delegate expressed it, "I have not learned as much in the same length of time since I left college."

THE program arrangement was unique, but distinctly businesslike, as befitted a gathering of business men intent on extending trade relations. Director General John Barrett, who presided, planned the proceedings like a railroad timetable,—and this was rigidly adhered to. Seven minutes, only, were allowed each speaker, or paper to be read, after which the speaker answered questions which any delegate was allowed to ask. The only restriction was to debar all subjects political, diplomatic, or controversial. After answering questions for not to exceed fifteen minutes, the speaker repaired to one of the committee rooms, where any delegates desiring special information met him for further questioning on details not of general interest to the assembly.

AFTER the first session the convention easily fell into a condition of cordiality which made the whole affair take on the nature of a great international family gathering. There was a good deal of eye-opening on both sides. As one South American said: "You have the impression we are volcanoes in continual eruption, while our people think of the United States as a place abounding in murders, divorces and railroad accidents." This opinion of us proved to be founded on the press dispatches sent out from the States, the correspondents here assuming the subjects named to be of chief interest to South American readers. Steps will now be taken to correct this condition.

IT is manifestly impossible to condense into these few lines even a general outline of the proceedings. It is planned, however, to issue in book form a verbatim report that should be in the hands of every business concern in the United States which has the remotest idea of considering export trade. As no appropriation is available, a small nominal charge will be made per copy, and, as the edition will be limited, orders for the book should be sent in at once. No public document of any government in the world on foreign trade affairs has anything like the practical value to our manufacturers that this book will contain.

AMONG the interesting discoveries, and there were many on both sides, was the common mistake of our manufacturers in sending catalogs printed in Spanish into Brazil. Portuguese is the language of Brazil, and not only do few Brazilians read Spanish, but they feel far from complimented on receiving a letter, circular or pamphlet printed in Spanish. Such literature is promptly consigned to the waste basket; and yet, through ignorance, tons of such matter are being sent constantly into Brazil. Spanish printed matter is proper for all the other Central and South American republics. In regard to traveling repre-

sentatives, it was strongly urged to send salesmen, not academic linguists, but if possible to send salesmen who can speak the language of the countries visited. Exporting firms in Great Britain and Germany not only do this, but have their men carefully educated in the social and business customs of the countries visited. While a bright Yankee salesman can accomplish a good deal through an interpreter, the method is not to be recommended. Another instance of business shortsightedness is the custom of many of our manufacturers to quote prices f.o.b. at their factory in some small, or even large town perhaps a thousand miles from nearest seaboard. The South American has no facilities for securing freight rates to port of export, and is thus frequently prevented from purchasing because he has no idea of the total cost.

IN the matter of packing, great improvement was reported, yet many shippers continue to pack in boxes which insure destruction of the contents. Europeans never do this, but pack with care, which insures delivery in a salable condition. While thousands of miles of railroad are already in operation, and thousands more building, the territories to be reached are so vast (Brazil alone being larger than the United States) that much of the shipments to the interior must go via river steamers for hundreds of miles, and then often transfer to pack trains. And yet the natural resources, and soil fertility of Argentine and Brazil especially, are such that with all our own native wastefulness we can scarcely comprehend the unlimited ability of these countries to purchase whatever they want, regardless of price. Productively these two countries are today what the United States was 100 years ago, and it is not hard to imagine what the present up-to-date business man would do if those conditions existed here today. Yet such are precisely the opportunities in South America at the present moment.

THE Episcopal bishop of Rio de Janeiro, a resident there for the past twenty-one years, and a native of Richmond, Va., said to me: "The great obstacle to a vast trade from the United States is our colossal ignorance of South American possibilities, and a lack of ships. We paid Brazil \$101,000,000 more in 1910 alone than she paid us, while the people of that country are earnestly anxious to buy a thousand articles and commodities we can export to advantage, and profitably." The same willingness to trade is true of other Pan-American republics.

AN interesting new sidelight was flashed on the Panama Canal. It was stated by a business expert that, upon the opening of the water connection, a vast clearing house for freight would be established there. Vessels from both the Pacific and Atlantic coasts of North and South America will dock at this central point, and discharge and reload entire cargoes of mixed freight. Thus a few tons of dried fruit, for instance, will find prompt through service from San Francisco to either Lima, Buenos Aires, New Orleans, or New York, without the delay of waiting for some vessel to secure a full cargo of freight to either of the ports named. The illustration will readily suggest the unlimited possibilities of commerce, not only to the large ports, but to a coastwise trade including over 12,000 miles of coast line. In addition, freight will clear promptly at the canal for all parts of the world.

WE are asleep at the switch while Germany and England are active in developing trade in a continent that during the next century will be the world's greatest producer of foodstuffs, and a correspondingly large consumer of everything we manufacture. Already Argentine is shipping more beef to Europe than the United States, and in a very few years we ourselves will be importing wheat. There is no time to lose, and it is to be hoped, as many, including the writer, believe, that the Pan-American Congress has advanced the possibilities of our export trade fully ten years.

H. H. WINDSOR.

N. Y. AUTO TEST PRESAGES PASSING OF FIRE HORSE

As a result of the recent successful test of a new type of self-propelled fire engine by the New York City Fire Department, it has been officially predicted that in five or six years there will not be a single horse-drawn fire engine, tender, truck or water tower in that city.

This auto fire engine differs from its predecessors inasmuch as it comprises a 110-hp. gasoline motor, under the hood in front, for propulsion purposes, and a separate steam-engine equipment in the rear, capable of pumping up to 800 gal. of water a minute at a pressure of 125 lb. per square inch, as proved by actual test. The engine attained a speed of 40 miles an hour in a test run under service conditions, which compares most favorably with the 12 miles an hour of the horse-drawn vehicle.



New York's Automobile Fire Engine

The engine weighs 16,000 lb. and cost the city \$9,772, of which \$5,272 represents the value of the steam engine, etc., and \$4,500 the motive machinery. Hereafter, the old horse-drawn vehicles can be converted into a similar type of auto engine at an estimated expense of \$6,000 each. The cost of maintenance of each machine

is stated to be between \$50 and \$100 a year, as against \$700 to \$800, the present yearly charges for a team of horses for one machine.

OVER THOUSAND TONS OF EXPLOSIVE "LETS GO"

One of the greatest explosions the world has ever felt occurred recently at Pleasant Prairie, Wisconsin, completely wiping out the powder plant, doing damage in a radius of 60 miles, and causing a commotion felt in five states. In all, 1,033 tons of explosive let go. Of this amount a little less than 1,000 tons was black (soda) blasting powder, of which 1,125,000 lb. was stored in one magazine and 870,000 lb. in another. In a third magazine was 65,000 lb. of dynamite, which was also detonated.

The trouble started in the glazing mill, where 1,000 lb. of powder was being handled. Fire from some source impossible to determine, but probably due to friction, ignited this powder,

and it is presumed that pieces of metal entered at least one of the magazines, the three of them exploding in rapid succession.

FRANCE STOPS TIME FOR A FEW MINUTES

A measure adopted by the French Senate resulted in the annihilation of time for 9 min. 21 sec. on March 10. At exactly midnight all the republic clocks were stopped for that length of time and then started again, this action making the time all over France exactly the same as that of Greenwich.

Owing to the change in time, a question arose in the French press as to whether or not a child that was born and died within the elapsed time could be said to have legally lived.

AIRMEN MAKE RECORDS WITH PASSENGERS

The past few months have been noteworthy in the history of aviation because of the development of passenger-carrying machines of great capacity. Where a few months ago airmen were contending for altitude, speed and endurance records, their efforts now seem to be centered on carrying aloft as many passengers as their machines will hold, and with additional weight thus gained, attempting endurance and distance flights. Roger Sommer is the record holder, up to date, having soared two-thirds of a mile with 13 persons in his biplane at Mouzon, France, March 24. While this is a greater number by one than was carried by Louis Bréguet at Douai, France, March 23, Bréguet is believed to have made the better flight in that he flew two miles with his passengers in a monoplane.

Perhaps the greatest passenger-carrying feat in the history of the science was that of Renaux who, on March 7, won the special Michelin prize of \$20,000 by flying from Saint Cloud to the summit of Puy de Dôme, a distance of 217 miles, in 5 hr. 8 min., carrying a passenger. Puy de Dôme is a mountain peak 4,800 ft. above sea level and the flight for the prize had been unsuccessfully attempted by several well known French airmen.

Notable also during the last few months has been the infrequency of serious accidents. Three persons are reported to have lost their lives. At Madrid an airman lost control of his machine while descending and one bystander was killed when the plane struck the ground. A dispatch from Krefeld, Prussia, announces the death of Paul Kayser, pilot of the balloon "Düsseldorf IV" as the result of a bad descent, the basket of the balloon having struck the water in the Zuider Zee with such force that Kayser was instantly killed, and his passenger seriously injured. M. Cei, the third victim, fell with his aeroplane from a height of 2,200 ft. at Paris, March 28.

He died a few hours after the accident.

The mobilization of a large body of troops in Texas, and the revolution in Mexico has enabled the army officers to use the machines belonging to the signal corps in some interesting experiments in carrying dispatches. A new Curtiss machine which was especially built for military uses has been purchased by the War Department.

Lieutenant Bague, of the French Algerian Rifles, established a new record for oversea flight, March 5, by going a distance of 125.5 miles over the Mediterranean sea from Antibes, France, to Gorgona, a small island between Corsica and Leghorn, Italy. He intended to land at Ajaccio, Corsica, but steered too far north.

J. A. D. McCurdy set a new record with his Curtiss biplane in Florida, March 6, by receiving the first wireless message in an aeroplane in flight. The operator who accompanied McCurdy picked up signals from several stations while aloft, in addition to taking a regular message addressed to the airman from the Palm Beach station.

One of the fastest short flights on record was made by Airman Say at Issy-les-Moulineaux on a circular course when he flew 63 kilometers (39.15 miles) in 32 min.

At Mourmelon, March 10, Nieuport established a new record for speed by flying 68.5 miles with two passengers at the rate of 64 miles an hour.

Rene Simon opened a new field of usefulness for aviation in Texas by rounding up a herd of a cattle on a big ranch near Houston.

Ice dealers throughout the country are being urged by a manufacturer of advertising novelties to give to each of their customers an ice pick the manufacturer is making, on the ground that "the more they chop the more they buy."

NONGYROSCOPIC AEROPLANE MOTOR TO INCREASE STABILITY

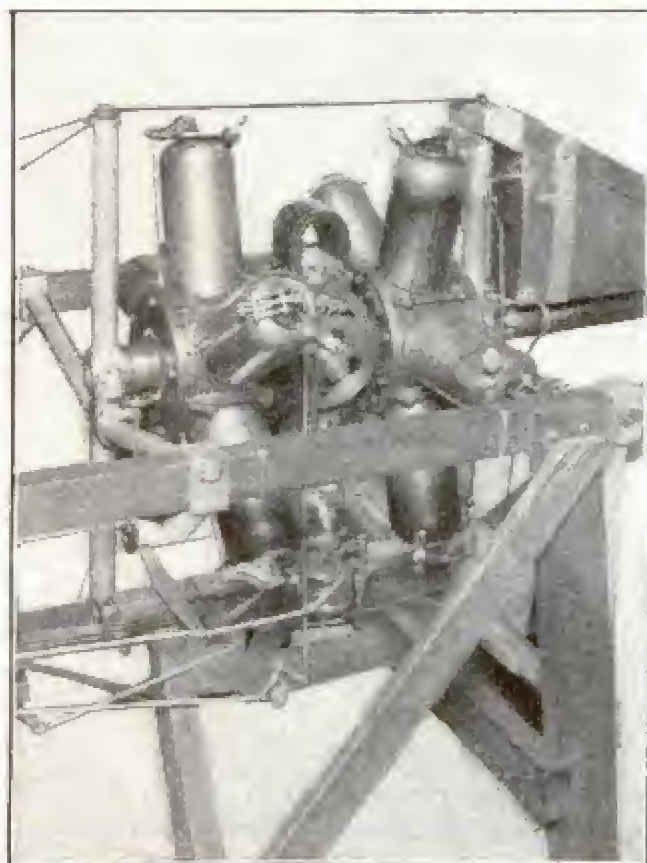
Inventor Pits Gyroscope Against Itself, Advancing Theory That Its Action in Flywheels and Revolving Motors Has Been Cause of Many Aeroplane and Automobile Accidents and Fatalities

By J. Q. ROBERTS

WORKING on a theory that many automobile accidents and most aeroplane disasters are caused by the gyroscopic action of the revolving parts of the motor when making a sudden change in direction of the machine, Thomas Preston Brooke, well known in many parts of the country as the former leader of the Chicago Marine Band, has designed an aeroplane motor in which this action is modified by dividing up the revolving parts into two units and making them turn in opposite directions.

It would seem, therefore, that what has been considered an aid to stability has under certain conditions been a mysterious agent of destruction. Mr. Brooke claims that the conditions under which the gyroscope aids stability are not present in the aeroplane or automobile, and his demonstrations with models seem to carry out his arguments.

The nongyroscopic motor weighs 172 lb., and develops from 75 to 85 hp. when both sections are operating. It has 10 air-cooled cylinders, 5 in each



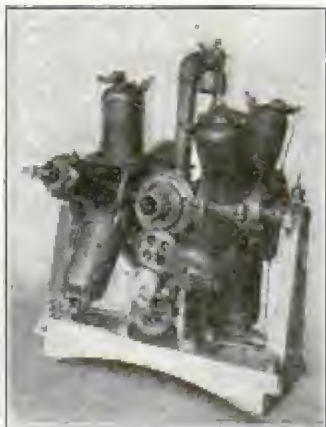
The Nongyroscopic Motor on Temporary Framework, Showing How Units Are Connected



Motor in Operation, Revolving Propeller at the Rate of 1200 R.P.M.



Thomas Preston Brooke,
Inventor of Nongyro-
scopic Motor



His First Nongyroscopic
Motor—Built Two
Years Ago

unit, and either half may be run independently of the other. This is considered an advantage for long cross-country flights, as one-half of the motor will develop enough power to operate the machine while the other half is resting and cooling off, if necessary.

The inventor has reduced the motor to a remarkable degree of simplicity by the introduction of many excellent mechanical features, some of them unique. All working parts and lubricating devices are inclosed in the crank cases, easily accessible; the ignition system is simple, and only 12 in. of high-tension cable are used in the entire motor; no timer is necessary; carburetor troubles are minimized by mixture of air and gasoline in crank case; the cylinders are offset; and every bolt is pinned. No trouble is experienced in starting the experimental motor, a throw of one-quarter of a turn sufficing.

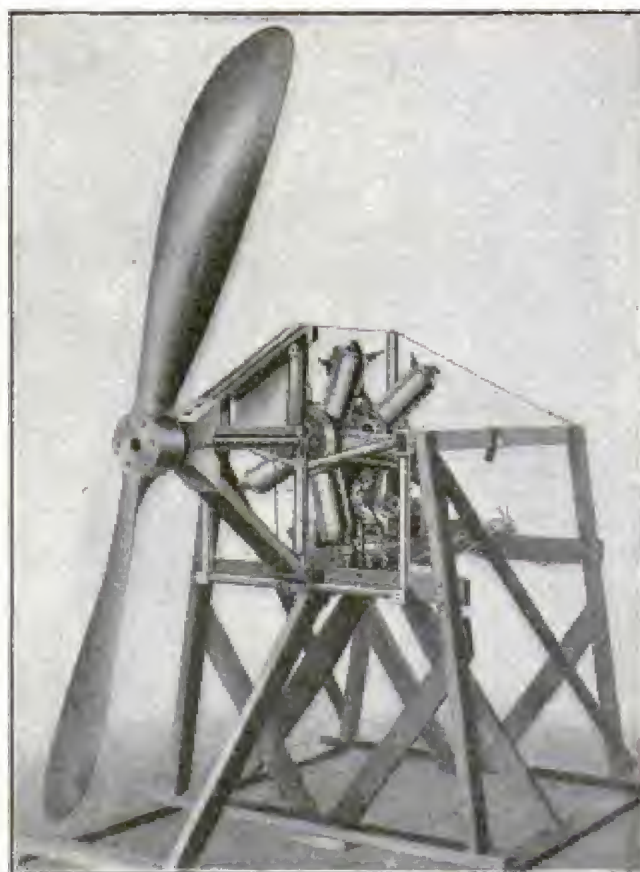
The discoverer of this means of utilizing the force of the gyroscope has driven an automobile for years, and it was while driving one of the first models that the phenomenon of the "skidding" car came to his notice. The older cars had very large and heavy flywheels, and the gyroscopic action was therefore more noticeable. The large racing cars of today, however, are also provided with heavy flywheels.

Mr. Brooke is the first to bring forward a motor involving this new principle. The Ligez motor, a recent

French invention, turns the crankshaft and propeller in an opposite direction from that of the revolving engine. A few months ago M. Bouchaud-Praceiq, a Frenchman, brought out the same theory before a French society of civil engineers. He mounted two small gyroscopes on a board and demonstrated the results of revolving them in opposite directions. It is a strange coincidence that he points out that the death of Chavez was due to the gyroscopic action of his motor, as does Mr. Brooke in the statement which follows. M. Bouchaud-Praceiq said in his discussion before the French society: "No doubt some day the aeroplane will carry two motors rotating in opposite directions, one driving a tractive propeller; the other a propulsive; the propellers also turning in opposite directions and exactly counterbalancing each other."

The American inventor made his first motor two years ago, and applied for his French patents last fall.

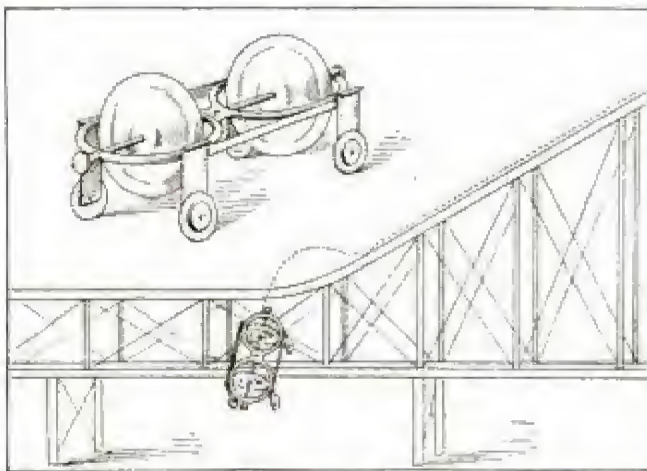
In discussing the theory of his invention, Mr. Brooke says:



Brooke Motor and Propeller on Framework Used for
Experimental Purposes

"Since Brennan employed the gyroscope to stabilize his monorail car, the idea has steadily grown that it would be a good thing to use this force in connection with flying-machine stabilizing until it has become an almost universally accepted theory. The gyroscope as used by Brennan is a vastly different proposition from that of the revolving parts of our high-speed aeronautic motors.

"In the accident that caused the death of Chavez, and also in those of more recent date that killed Moisant and Hoxsey, the aviators had just finished a long glide, and, while traveling at a terrific speed, suddenly changed their paths from an angle of 30 deg. to a horizontal. In each of the above cases the motors were running at



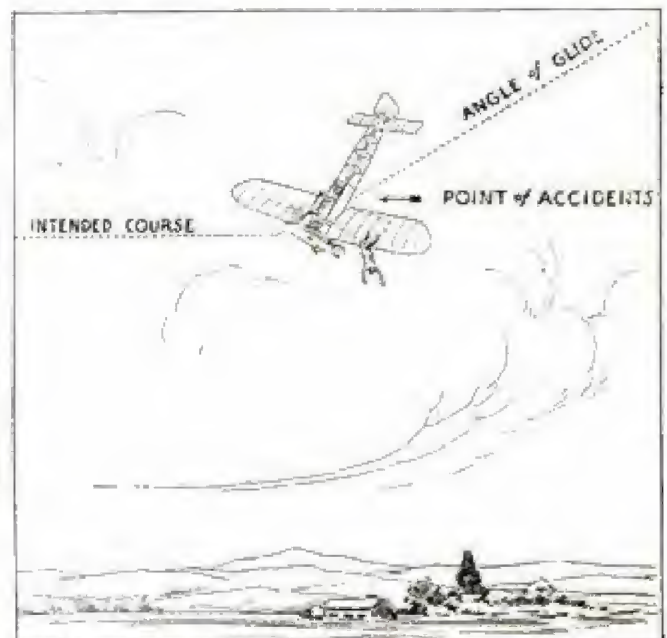
Model with Two Gyroscopes, Which When Revolved in Same Direction, and Run Down Incline, Acted as Aeroplanes Do Under Same Conditions. The Model Turns to the Left and Leaves the Track

highest speed and were all revolving anti-clockwise as viewed from the front. All the published accounts of these accidents agree in that 'at the point where the elevator was raised to alter the gliding angle the machine seemed to shudder for an instant, turn slightly to the left and plunge downward.' This tallies exactly with dozens of my experiments, conducted to demonstrate the cause of these accidents, and in not one instance has my apparatus failed to act just as did these aeroplanes when subjected to the same conditions.

"The presence of this force in the flywheels and clutches of automobile motors has been the direct cause of at

least 75 per cent of all automobile accidents. It is this force that lifts the rear wheels of a two-ton automobile clear of the pavement and causes it to slowly skid or revolve until very often the auto has turned a complete circle. Again it has caused autos to skid around into the path of an oncoming train, causing loss of life and property, or again, has smashed the wheels of the auto against the curbstone.

"The most common accident as the result of this force is that of causing two autos to collide. The cars meet on a curve or short turn in the road; both drivers release their 'clutches'



Inventor's Theory of Cause of Accidents—Gyroscopic Force Gets in Deadly Work at Point of Change in Direction

to be ready to apply their brakes and by this action allow their motors to jump to a high speed of revolution. This high speed, coupled with the revolving parts of the motors all turning in the same direction, immediately sets up a terrific centrifugal force, the sudden swerving of the autos awakens the slumbering gyroscopic force, causing the autos at once to begin to skid or float.

"It is this force that causes nearly all the accidents to racing automobiles, either directly or indirectly. One reads in the newspaper accounts of these fatal accidents, that 'just as . . . in his 100-hp. car started to

take the curve the machine seemed to leap into the air, and, with a corkscrew motion, turned completely over, crushing and instantly killing him and his mechanician.' No less than four of these accidents happened during a recent speedway meeting and the description quoted above fits exactly to each case.

"If gyroscopic force is so dangerous and destructive in its action to the automobile motor, what great havoc must it create through the motor of the delicately constructed and poised aeroplane! The flying-machine of all kinds is continually subjected to sud-

den shifts from its direct path of flight by side gusts of wind. What, then, must be the force exerted by the high speeds of aeronautic motors and particularly that of the revolving kind.

"In the accounts of accidents to aeroplanes one almost invariably reads that 'for some unknown reason the aeroplane seemed to swerve suddenly to one side, crumple up and crash to the earth a tangled mass.' When one fully understands the erratic action of gyroscopic force there can remain no cause for wonder at these accidents, and the only marvel is that there are not more of them."



NEW YORK STATE CAPITOL DESTROYED BY FIRE

Fire wrecked the beautiful state capitol building at Albany on March 29, millions of dollars damage being caused by the flames. The greatest damage occurred in the library, which contained thousands of volumes, pamphlets, and historical manuscripts, the loss of which is irreparable. The handsome assembly chamber was wrecked, and the main staircase in the building, which cost \$1,500,000 was ruined.

WOODEN BALL REMOVES SEWER OBSTRUCTIONS

A most effective method is used in Paris to remove obstructions from the sewers. A hollow ball 6 ft. in diameter, made of wood, is lowered into the sewer pipe and the flow of the sewage starts it rolling toward the Seine. The ball is so heavy that only the most extraordinary obstructions can stand before it and its failure to pass certain points along the route gives notice of the presence of such obstructions. The ball is built in sections and these are put together at the place where it is to be lowered in the sewer. When the sections are put together they are covered



Lowering the Huge Wooden Ball into One of the Sewers of Paris

with a framework of metal and the whole ball is allowed to bound through the sewers. This method of removing obstructions is in continual use in Paris now, the municipal officials feeling that they must leave nothing undone to keep the drains of the city free and eliminate as far as possible further flood danger.

ITALIAN SOLDIERS AS TRICK CYCLISTS

The Bersaglieri cyclists of the Italian army are veritable acrobats, performing as many "stunts" as might be expected of a circus troop. The Bersaglieri, or sharpshooters, are Italy's



Gun Drill on the Shoulders of Companion Cyclists

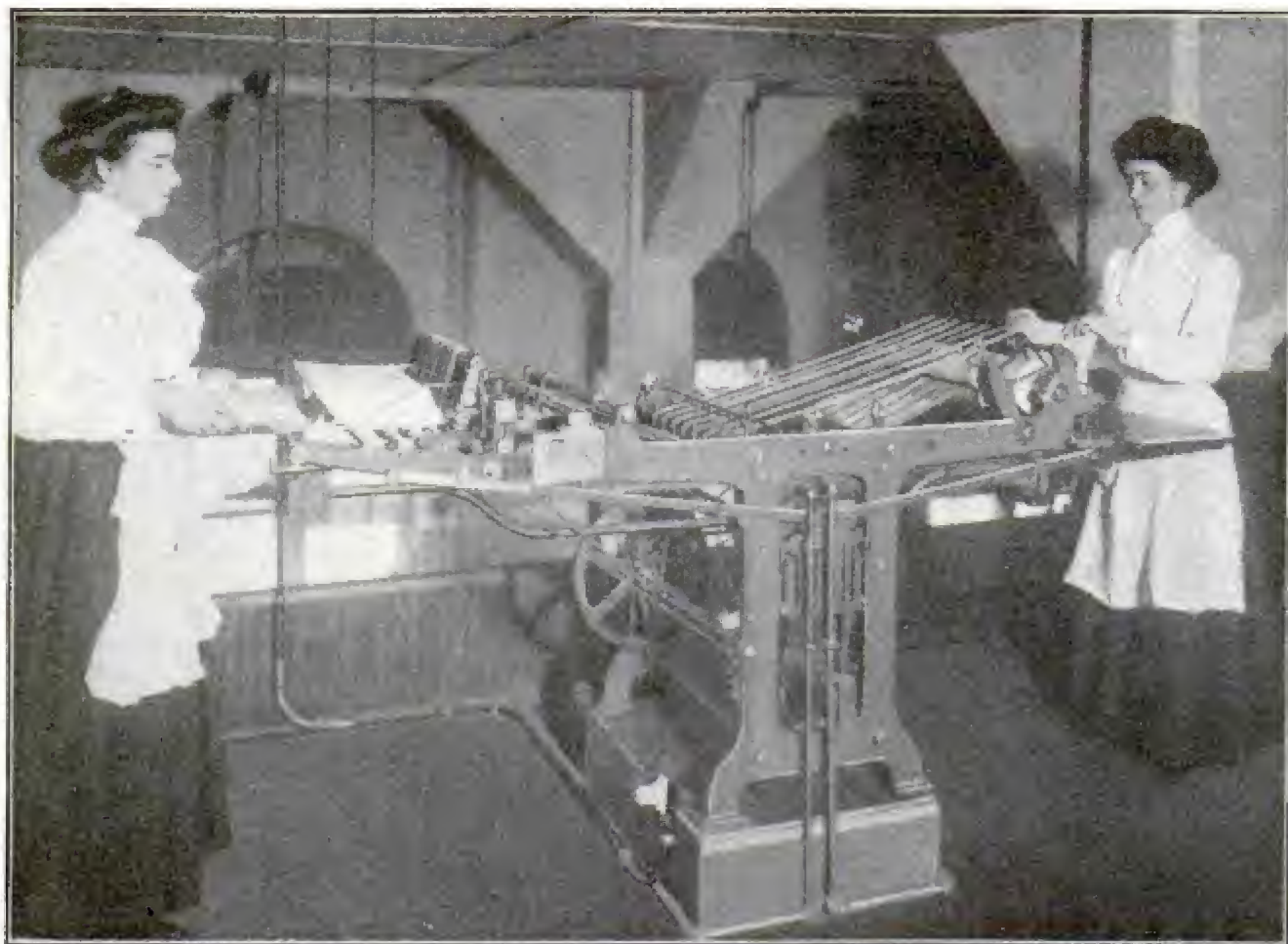
most popular soldiers. The special duty of the cyclists in time of war is to co-operate with the cavalry, occupy important strategical points on the line of advance, and draw the enemy's fire.

PARADING FOR QUININE

So called "quinine parades" occur in every part of India during the malaria season, the natives marching to the hospital and squatting down in lines to await their turn in being dosed. In order to make sure that each swallows the proper dose, the hospital assistants pour the liquid quinine into the mouths opened to receive it. The illustration shows a sepoy in the act of swallowing a dose dropped into his mouth from a glass measure. From the expression on the face of the native at the right of the illustration it is obvious that the dose he received was not altogether pleasant.



Dosing the Natives of India with Quinine



This Machine Saves the Government \$42,000 a Year by Dampening Currency Paper

UNCLE SAM'S AUTOMATIC DAMPENING MACHINE

By THOMAS D. GANNAWAY

The United States government is in possession of the latest improvement in the art of plate printing. There has been invented for the Bureau of Engraving and Printing at Washington, a machine which it seems will greatly advance the art of printing paper money. There has been but little change in the art of plate printing since its invention in Italy nearly 400 years ago.

So difficult is the printing of paper money that it all has to be done on hand presses. And yet it is impossible to get perfect impressions on the paper. In order to make perfect and uniform prints, the paper must be of a uniform condition. Before the printer can use this paper, it must be wet and then allowed to lie awhile and absorb the moisture. The best approved method

of doing that is by hand. A board a little larger than a sheet of paper is used for a starting base. On top of this is put a wet cloth, then 20 sheets of paper, then another wet cloth, and another 20 sheets of paper, and so on until there are 1000 sheets in the stack. This stack is then put under a slight pressure for 24 hours. It is then taken out and, naturally, the sheets which were next to the cloths are wetter than the others. These packs of 20 sheets have to be split in the middle and the wet sides turned together and then repacked as before for another 24 hours. On account of the cloths absorbing the animal matter contained in the sizing which the manufacturer has put on the paper, a new (or different) set must be used each time, as they will sour if left in the package too

long, thus injuring the quality of the paper. Notwithstanding all of this time and trouble, the paper is not uniformly wet.

When a sheet of paper has received the proper amount of moisture, it will have expanded $\frac{1}{2}$ in. If it is too wet, it will expand more than this and if it is not wet enough, it will not expand so much. When these sheets have all been printed and then put through the drying process, they will contract back to their natural dimensions. One can, now, readily see that there will be a variation in the dimensions of these notes, which at one time was considered evidence of counterfeit, but upon a thorough investigation, it was found that it was impossible for the plate printer to print them so that they would all be of a uniform size.

The new automatic dampening machine wets every sheet exactly alike and does 48,000 of them in seven hours. Three girls can operate two machines at once. The feeder, feeding from the bottom of the stack will operate successfully under 3,000 sheets. The sheets are carried through a tank of water in the machine and up through a rubber wringer which has been adjusted so as to leave the proper amount of water in each sheet. It takes 5 lb. of water to 1,000 sheets to properly mellow them. They are taken from this machine to a humidor.

This humidor is an airtight case constructed especially for this work. The paper may lie in it a week without injury, whereas, by the old method of wetting, it has to be used within 24 hours after the second wetting.

Wetting the paper by hand costs the government 52 cents per 1000 sheets, while with the machine it can be done for 14 cents, thus making possible a saving of \$42,000 per year on this one item.

Hereafter all arms, ammunition, uniforms and other equipment for the Chinese army will be manufactured in China.

GASOLINE TRACTION CULTIVATOR

This three-wheeled gasoline traction cultivator and general utility power plant for farm work weighs 4,500 lb. and develops 25 hp. The drivewheels



Gasoline Traction Cultivator Making a Turn

are 5 ft. in diameter and adapted to travel over ground of any character. The feature of the machine is its flexibility of movement. By locking one or the other of the drivewheels and turning the steering wheel as far as it will go, the single rear wheel turns at right angles and the machine describes a half circle, coming into position to cultivate the next two rows without the necessity of stopping or backing.

The treads of the drivewheels are 6 in. broad and 10 in. long, set at an angle, with an open space of $2\frac{1}{2}$ in. between each, so that the soil may pass through instead of packing hard.

ALUMINUM ELECTROMAGNET COILS

German electrical engineers have introduced an innovation in electromagnet manufacture, making the coils of bare aluminum wire instead of insulated copper wire. The aluminum immediately becomes covered with a whitish film of aluminum oxide when brought in contact with humid air, and this provides an excellent insulator. It is claimed that a short circuit between the windings is impossible with these coils.

SOME HISTORICAL ABSURDITIES WHICH



A Future Novelist May Easily Get Mixed Up in His Dates and Imagine the "Maine" to Have Been Sunk by a Bomb Dropped from an Aeroplane



It Is Quite Probable That Some Careless Author May Overlook the Fact That the X-Ray Was Not Known Until 30 Years after the Civil War



Joan of Arc, Seated at Her Sewing Machine, Dreams of Driving the English from France, More Than 400 Years before the Machine Was Invented

"In the darkness of the night a tiny monoplane with muffled engine shot out silently from behind the forts of Havana and crossed and recrossed the ill-fated 'Maine' which was lying at anchor in the harbor. The airman began to drop his deadly bombs. Splash! The first one missed and fell into the water. The second aim was deadly and true. Down one of the big smokestacks fell the tiny engine of destruction. A muffled roar, and the doomed ship commenced to sink. What of the airman? History does not relate."—*22nd-century novel.*

Of course such a statement is absurd. Only 13 years ago was the "Maine" sunk in Havana Harbor. But the historical novelist of 200 years hence has no such near view of the facts. He is looking back through a long perspective, and the war with Spain will probably have been overshadowed by the greater significance of later events.

The aeroplane is now a new invention. At the time of the Spanish War it was unknown as a practical piece of apparatus. It therefore could not have been used in connection with the blowing up of the "Maine." The supposed writer in the 22nd century would thus have perpetrated an anachronism, that is, a historical portrait including an idea wrongfully borrowed from a later period in history.

In the suppositional case previously cited, the difference in time is but a few years. Twelve years or so later, the sinking of a ship by means of a bomb dropped from an aeroplane would have been feasible and even probable under the circumstances.

More remarkable anachronisms than this have occurred in the works of some of the best painters and in the writings of the most celebrated authors and novelists. Thus, in his picture of the manna gathering in the desert, Tintoretto has armed the Hebrews with guns. Thackeray, writing of an incident of the year 1712, mentions a novel which was not published until 1750. Schiller records the use of a lightning

MAY BE COMMITTED BY FUTURE WRITERS

conductor more than 100 years before the date of its invention. The Virgin Mary has been represented in paintings as an Italian peasant woman and as a Dutch housewife, and in an altar piece at Capua she is shown seated in a rich arm-chair, with a cup and a silver coffee-pot standing on the table beside her.

Even Shakespeare is not free from historical misstatements, though probably these were made for the sake of effect. Thus, the great dramatist in Julius Caesar makes Cassius say "the clock hath stricken three," although striking clocks were not invented for many hundreds of years later than the time of the Roman emperors.

Goldsmith was nearly hoaxed into putting into his "History of Greece" an account of a battle between Alexander the Great and Montezuma, and John Britton makes Judge Jeffreys preside at the trial of Charles I, although the infamous jurist was only one year old at the time of the execution of that unhappy monarch.

These are but a few of the many anachronisms that are on record. Since the 18th century, writers and painters have usually been careful to ascertain the true circumstances and depict them accordingly, but the fact remains that it is almost impossible for a novelist to project his mind into the atmosphere of a by-gone age and reflect faithfully the life and character of the times of which he writes.

The last century has witnessed some wonderful developments. The first ten years of this present century are crowded with important happenings. The commercially successful automobile, the wireless telegraph and the aeroplane are innovations still fresh in the minds of even the younger generation of today. How easy, then, will it be for a writer centuries ahead to confuse the priorities of these several wonders of an inventive age, especially as the probability is that many more wonderful things will be developed in the years to come.



George Washington Posing for His Photograph! The "Father of His Country" Died 40 Years before the First Photographic Portrait Was Taken



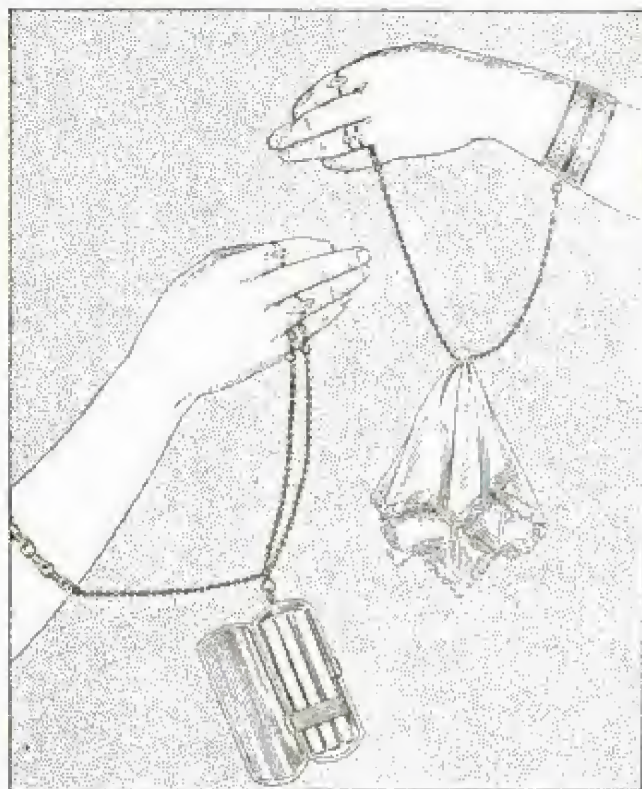
Napoleon Antedates the Telephone by 55 Years, the Machine Gun by about 50 Years, and the Modern Revolver by 30 Years



Chinese Gordon Might Have Been Saved at Khartoum If He Had Had the Wireless Telegraph. But the Latter Came 10 Years after His Death

"LOOP" JEWELRY LATEST FAD

The latest fad for the adornment of hands and wrists is called "loop jewelry," and consists of one or more



Chains Supporting Cigarette Case and Fastened to Finger Rings and Bracelet and the "Loop" Chain as a Support for the Handkerchief

trinket-supporting gold chains connecting the finger rings and bracelet. Among the articles designed to be carried by the chains are puff boxes, cigarette cases, mirror lockets, watches, etc. The chains are also useful as handkerchief carriers.

Advocates of the chain fad say that such adornment is an effective disguise

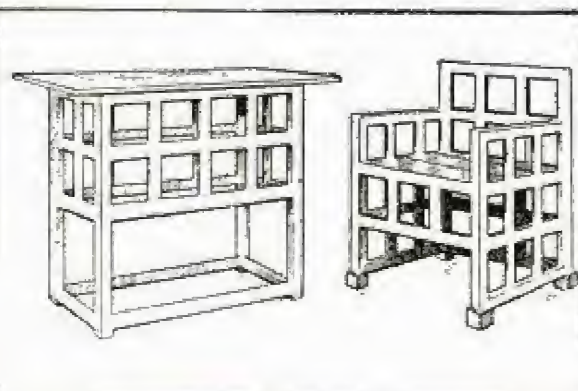
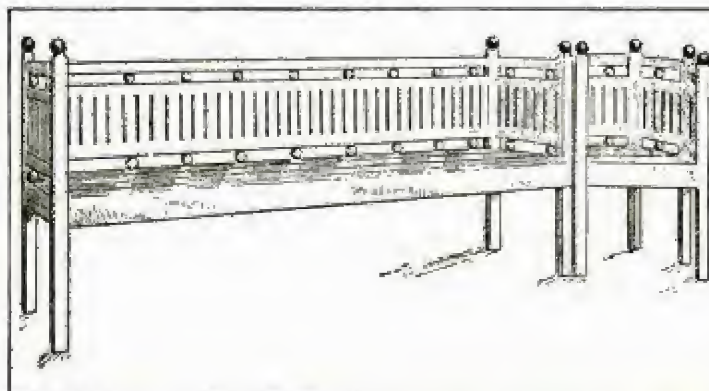
for lack of symmetry of arm, wrist, and hand, and that two or three chains, each carrying a trinket, cause angularities and disproportions to disappear.

TWO NEW PROCESSES FOR MAKING BALLOON GAS

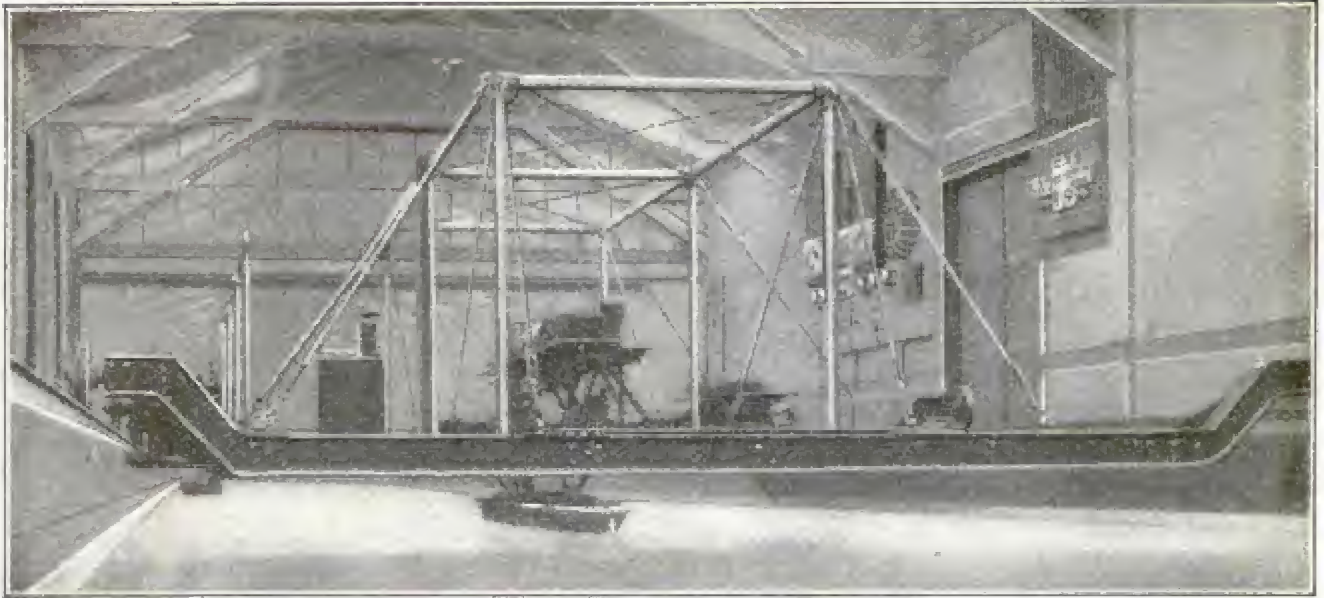
Two new methods of making balloon gases are being tried out in Germany.

One method consists in treating water gas with an absorbent to remove the carbon monoxide and the hydrocarbon compounds, or achieving a similar result by passing the gas through coke-filled retorts heated to 2,200 deg. F. The resultant gas contains from 80 to 84 per cent of pure hydrogen, and can be made (in Germany) at an estimated cost of 75 cents per 1,000 cu. ft.

In the other process, a clay-lined iron retort is nearly filled with coke, ignited, and raised to a white heat by an air blast. The retort is then closed, and petroleum or coal tar is introduced from the top for about 20 minutes. The gas thus generated is passed through a sprinkling tower and filtered into the gasometer. The process is then repeated indefinitely, with periodical renewing of the retort charge and removal of the ashes. The gas contains about 94 per cent of pure hydrogen, which may be increased to 98.4 per cent by a further treatment. The cost is but little, if any, greater than in the first process, although the gas produced is much lighter.



An artistic type of garden furniture for more or less formal small gardens is shown in the accompanying illustrations. It is apposed to the rustic and is suitable where rustic garden furniture would be out of place. Courtesy "The House Beautiful"



Experimental Tank at Bremerhaven for Testing Ship Models

EXPERIMENTAL TANKS FOR SHIP MODELS

Not a little of the success of the ships of a large German shipowning company is attributed to experimental work with ship models in tanks at Bremerhaven. Every naval country of importance now has its model tanks, and many shipbuilding firms are so equipped.

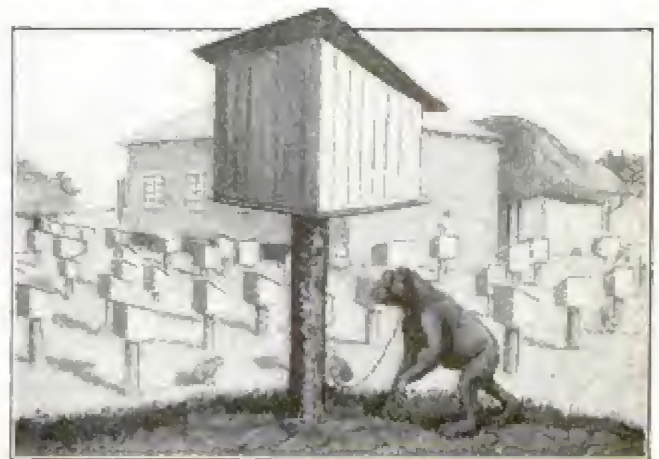
It took many years of careful research to demonstrate that the resistance of a large ship could be predicted with reasonable accuracy from experiments made with a small model. The total resistance to a ship is divided into frictional resistance, wave-making resistance, eddy-making resistance and air resistance. The total of these components is the aggregate resistance.

The basin of the big German line laboratory is 418 ft. long. The models are made of paraffin wax, and are from 15 to 18 ft. in length, and when finished with are melted again. The models are attached to a moving platform which spans the basin. This platform is virtually a traveling laboratory, with delicate instruments for noting the behavior of the model which is attached to it while resting in the water below. Before the keel of a new liner is laid down in the shipyard, from 20 to 30 models are invariably made and tested.

The National Physical Laboratory at Bushey, Eng., has recently constructed two notable tanks for this purpose. In one, the ship model will be held stationary while the water is circulated past it at a uniform velocity. The other will be used for moving models. Thousands of dollars are often saved as a result of such tests.

COLONY OF INOCULATED MONKEYS

In the war waged against the deadly "sleeping sickness," the germs of which are carried about by the tsetse fly, the British government has established an experimental station at



Colony of Monkeys Inoculated with the "Sleeping Sickness" Germ

Uganda, British East Africa. At least one hundred monkeys have been inoculated with the disease, and their symptoms are being constantly studied in the endeavor to find a vaccine or serum to fight it. The monkeys are kept in the open, each having an individual home in the form of a box mounted on a post.

the Moro province of the Philippines, the provincial capitol building was erected of concrete blocks almost entirely with Moro labor. These people are classed as among the civilized tribes of the Philippines. They are Mohammedans of the most extreme type and were never completely under Spanish domination in the days before



Moro Workmen Making Concrete Blocks for Their Provincial Capitol Building

PHILIPPINE MOROS BUILD CONCRETE CAPITOL

The concrete-block machine bids fair to rival the harvester appliances as a sign post of American enterprise around the world. In all sections of the earth, concrete construction has received a tremendous impetus during the past few years and structures of all sorts made of solid concrete or cement blocks are likely to greet the traveler, no matter what out-of-the-way port he may visit. The facility with which the work is done is the principal appeal it makes to builders in far-away places. Skilled workmen are not necessary. Recently in the city of Zamboanga, the capital of

the American occupation. Since 1898 they have acknowledged the sovereignty of the United States, however, and the people who had been warriors, pirates and bandits became fairly industrious citizens. Photographs of the construction work on the provincial capitol show Moros doing practically all the day-labor jobs. One of these was making concrete blocks, the Moros turning out 100 blocks each day of eight hours with each machine. They were paid at the rate of 50 cents per day.

Recent reports show that the English import from America 808,528 lb. of gumdrops annually.

DISTINCTIVE PLAN FOR SMALL CONCRETE HOUSE



Front Elevation, Showing Entrance and Loggia at the Side



FIRST FLOOR PLAN



SECOND FLOOR PLAN

Mink and Carson, Architects

The distinctive feature of this house plan is that it contains but one chimney and its stairway arrangement is out of the ordinary. The estimate of cost by the architects is \$4,800. The building is to be constructed of concrete and finished with moderate price mill work and trimmings. Two stories and an attic are



Plan of the Attic

provided for, giving eight rooms and a large, roomy hall. The chimney rises in the center of the building and a large fireplace is provided for the living room. A small entrance porch and an attractive loggia or porch at the side together with a living room of unusual size, are features of the plans.

AEROPLANE DESIGNED FOR SOARING FLIGHT

Mons. M. Gonnels, a French airman, has designed an aeroplane that will be especially adapted for soaring flight by combining a boat-shaped bracing and



Front View of Gonnels' Aeroplane

supporting planes with parachute-like wings. The inventor claims that his machine will execute the dangerous vol-plane with greater safety than any of the present models. While the span of the wings is but 10 ft. 5 in., the planes have great length and 376.75 sq. ft. of surface. With a 50-hp. motor, the inventor has been able to obtain excellent results with this unusual machine.

CURIOUS TRACER INFORMATION

An advertisement recently published in the Optician, London, offering a large reward for a "wanted" man, described his facial characteristics in the following unusual manner:

"Usually wears a pair of rolled gold curl-side spectacles, centers $2\frac{1}{2}$ in. (unsymmetrical face), left eye $\frac{1}{8}$ in. farther from median line than right eye, bridge $\frac{1}{8}$ in. up, and $\frac{1}{4}$ in. out. No. 3 nose, caliber 14, glazed R. — 1^D . + 2.75^D . hor. L. — 0.5^D . + 2.75^D . 20° . His complexion is freckled, and he has fair hair, ginger-colored, slightly deformed ears, height about 5 ft. 2 in., slight build."

ELECTROPLATING PORCELAIN WITH SILVER

The network of thin silver in a variety of ornamental designs now so popular in this country as a decoration for glassware, is applied to the glass by an electro-deposition process, which has greatly cheapened the cost over that of the original hammered silver plate. The same process is now being used for coating the whole exterior of porcelain ware with a shell of silver, the articles at present offered consisting chiefly of platters, bowls, tureens, teakettles, coffee pots, tea sets and egg bowls. The process of producing a conductive coating on the porcelain is accomplished by dissolving the silicate of

an alkali and suspending finely powdered graphite in the solution. This is applied to the surface of the porcelain.

KANSAS FARMER HAS HOG FOR A MOUNT

While Maud S., who is a gentleman hog by the way, tips the scales at 800 lb. and would bring about \$65 on the



Reliable as a Mount, but Not Much on Speed

market, P. I. Nelson, a Kansas farmer, who owns him, has refused \$200 for him. The reason is that Maud S. has been broken to the saddle and the owner frequently rides him around his farm. Maud, however, isn't much on speed, his best record being a half mile in seven minutes.

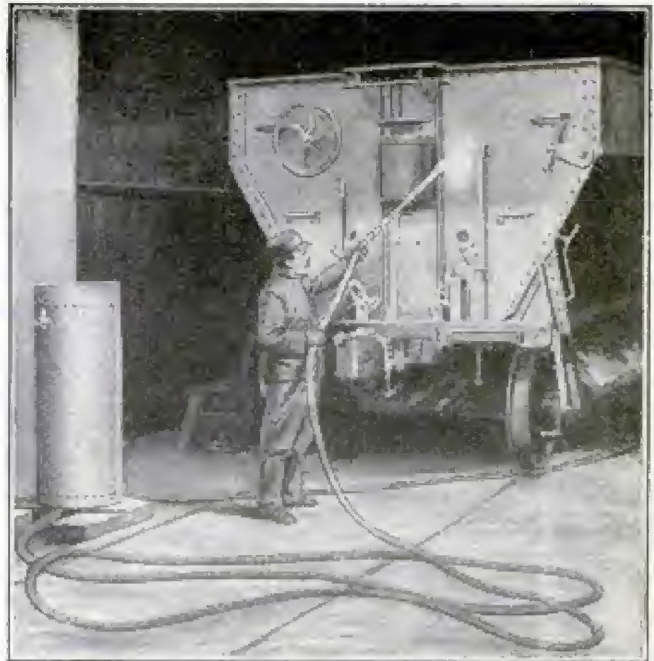
THREE VOLUMES VALUED AT \$40,000

The three volumes of Fox's "Book of Martyrs," which belonged to John Bunyan during his imprisonment in the jail at Bedford, England, and, with the bible, constituted his entire library, are to be sold by the corporation of Bedford to pay off a mortgage on its library building. The volumes have been owned by Bedford since 1841 and are valued at \$40,000.

John Bunyan was sentenced to perpetual banishment under the act against conventicles, passed following the restoration, and was placed in Bedford jail, where he remained 12 years. It was during this imprisonment that he wrote the "Pilgrim's Progress." Sets of Fox's Martyrs of the same edition as the one owned by Bunyan may be bought for \$150, so that the fact that these three volumes belonged to him is accountable for \$39,850 of their value.

CLEANING STEEL CARS WITH SANDBLAST

A sandblast apparatus is used at a western car plant as a simple and economical means of cleaning steel cars before painting. The sand, driven by an air pressure of 90 lb., smooths off all rusted surface and gets into the corners around the bolt heads and



Cleaning Steel Car with Sandblast

rivets, where it is difficult to do effective work with hand tools. One man and apparatus clean three cars a day.

FEEDING GULLS ON LAKE MICHIGAN

While the fishing tugs are running home to Manistique after hauling the nets in Lake Michigan, the crew dress the fish and throw the offal into the lake. Thousands of gulls follow the tugs to partake of the daily feast, swooping into the water and bearing away the offal as fast as it is thrown overboard. The scene is an exciting one, the gulls screaming and crowding in the struggle, which often lasts for hours at a time.



Hundreds of Gulls Feeding on Offal Thrown Overboard from a Fishing Tug

YOUNGEST AIRMAN IS BUT THREE YEARS OLD

No dolls, rattles, toy soldiers, or Noah's ark menageries are to be found



Three-Year-Old Frank Lawson, the Youngest Airman in the World

among the playthings of three-year-old Frank Lawson of Mineola, L. I. He is the youngest airman on record and he made his first flight in the machine owned by William Hilliard, for whom the elder Lawson works. Mr. Hilliard took his mechanic and little Frank for a trial spin in his big machine at Mineola. After three circuits of the aviation field, the machine was brought to the ground very much to the disappointment of the boy, who wanted to remain in the air. The boy was held in his father's arms during the flight.

MOTION PICTURES WITH LIGHTS TURNED UP

A hitherto much criticized feature of moving-picture or magic-lantern entertainments is the fact that the hall has to be darkened while the pictures are being shown. Apart from the moral side of the question, there is the ever-

present danger of stumbling when passing to or from one's seat in the dark.

Two recent inventions, brought out almost simultaneously, enable the pictures to be shown in daylight or with the artificial lights turned on. One of these establishes an artificial contrast on the screen by projecting a very bright light around the edges, the inner portion, on which the picture is projected by the ordinary machine, being shadowed by an opaque slide in the first machine. The other invention consists in treating the screen with a preparation of aluminum so as to give it a fine granular texture. The pictures are projected in the ordinary way. Each of these methods is said to give excellent results.

TRAINING POLICE DOGS TO JUMP FENCES

If a criminal being tracked by a police dog goes over a fence or wall, the dog, naturally, must follow, and to make this possible the Swiss police train the dogs to surmount obstacles that would daunt the average canine. In the illustration a dog is shown making his way over a practice fence.



Training Police Dogs to Jump Over High Fences and Walls

FROM TORCH TO TUNGSTEN IN LIGHT'S HISTORY



Pine Torch

"Betty" Lamp

Whale-Oil Lamp

Candle

Fluid Lamp

The ten stages of artificial light, as calculated by a Rochester, N. Y., electrical expert, offer an interesting study of history as well as an exposition of the progress of invention. The ten steps toward the electric light of today are given with the pine torch in the first place followed in regular order by the "betty" lamp used by the ancients and the people of the 18th century; the double wick whale-oil lamp; the candle; the fluid lamp, used during the middle of the 19th century; the open-flame gas light, used from 1817 to the present time; the "Rochester" burner, used from 1860 to the present time; the reflectolier or incandescent gas lamp; the carbon incandescent electric lamp, and the Mazda lamp, used since 1909.

The pine torch is the earliest known form of artificial illumination. It may have lighted the Garden of Eden on dark evenings, history relates nothing to the contrary. The "betty" lamp was the old floating wick light that is to be found in all pictures that pretend to show the forms of illumination of an-

cient days. It had many distinct types, always made on the same principle.

The whale-oil double wick and the fluid lamp were improvements on the "betty" lamp in that they gave much more light. Both came into use during the middle ages. The fluid lamp used camphene, an explosive mixture of alcohol and turpentine and had a very brilliant glow. The candle was perfected in 1740.

The earliest of the open-flame gas lamps was very little different from the type used today and the cost has been estimated at 3/100 cents per candlepower per hour. The introduction of the gas lamp was the beginning of the epoch of brilliance in illumination. In 1860 the "Rochester" burner for kerosene oil lamps was introduced and was found to have a smaller candle-hour cost than gas by 1/100 cents. The most important step in the development of illumination as a science was taken when the carbon filament incandescent electric lamp was invented, the cost of which was estimated at 6/100 cents per candle-hour.



Rochester Burner

Open-Flame
Gas LampIncandescent Gas Lamp
or ReflectolierCarbon Incandescent
LampTungsten Lamp
with Reflector

REMARKABLY SLENDER CONCRETE BRIDGE

A remarkable bridge of reinforced concrete has been erected to connect

It is 172 ft. long in one span, and is supported mainly by two parallel arches abutting against the cliffs at the ends. The width between the horizontal beams is but $4\frac{1}{2}$ ft., and the footway is 150 ft. above the surface of the water. Concrete was used in preference to steel because the bridge is in such an exposed position as to be often enveloped in spray, which would make the life of steel short and its maintenance costly.



Long, Slender Concrete Span Bridge in Ireland

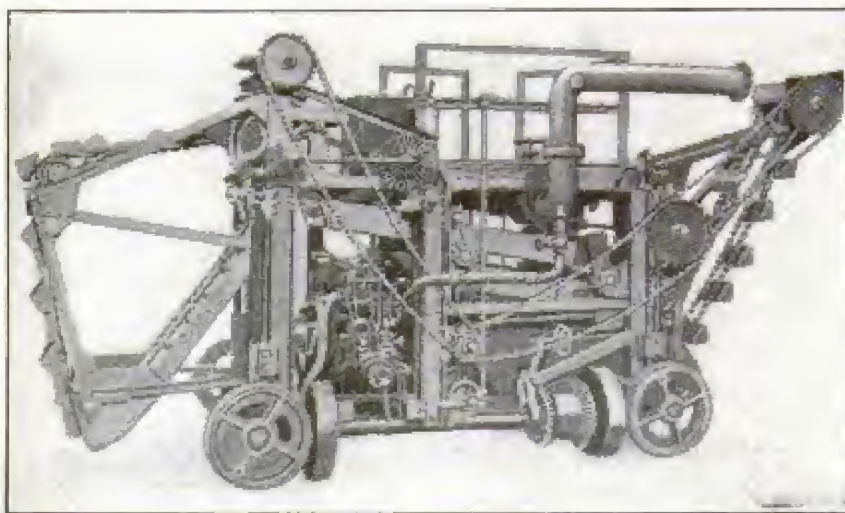
two cliffs over an arm of the sea at the extreme southwest point of Ireland.

to the fog-signal station on the island cliff.

TRAVELING SEWAGE-CINDER WASHING MACHINE

The unusual type of cinder washing machine built to meet the special requirements of the sewage disposal plant at Salford, England, embodies

the world, as it handles on an area of less than 20 acres the sewage from a population of 250,000 people. On this space are plants for pumping and chemical precipitation, rough filtration beds, and trickling bacteria beds. The sludge is shipped to sea by steamer.



Self-Propelled Machine Used to Wash the Cinders Which Form the Bacteria Beds of an English Sewage-Disposal Plant

several interesting features, one of which is self-propulsion.

The sewage plant in question is claimed to be the most concentrated in

The cinder bacteria beds, covering eight acres, are without division walls, but arranged in a number of bays, or sections, to allow of alternate working and resting. Although frequently raked, and occasionally dug up, these beds have been worked nearly nine years without the thorough cleaning that is now being given them with this machine. It runs on the concrete bottom of the beds, traveling forwards or sideways,



Japanese Girls Participating in an Open-Air Addition Match

excavating the bed in front of it, washing the material, and then depositing it again behind in layers.

At the forward end of the machine is a bucket-digger, carried on a frame pivoted on a vertical axle so that it can be swung to the right or left. The buckets tip the cinders and clinkers onto the uppermost of two shaker screens, carried within the frame. The screens are of strong wire, the upper one having holes 1 in. square, and the lower one but $\frac{1}{4}$ -in. square. The washing water is supplied in the form of a spray above the upper screen. All the material too large to pass through the upper screen is deposited by chutes on the floor of the bacteria bed, forming the lower layer. The material which passes through the upper screen but is too large to shake through the lower, is lifted by a chain bucket-elevator and deposited on the top of the larger material, thus forming the upper layer of the newly formed bed.

A cheap method of making nitrate for fertilizing purposes consists in passing an electric current through sea water and then passing electrified air through the resulting solution.

JAPANESE GIRLS IN AN ADDING RACE

One of the most curious events, to the tourists at least, of the athletic meeting of the savings bureau of the Japanese department of communications, held recently in Tokio, was the addition match for the female employees. The illustration shows the girls, all in line as if set for a 100-yd. dash, hard at work adding. The Japanese do not add with pencil and pad or slate, but use a frame of wires strung with balls, which are slid back and forth in making the calculations. The Chinese calculating frame is called an abacus, and the Japanese frame a soroban.

FOOD-PRESERVING POWER OF SUBSTANCES

The preservative power of certain substances used in food products at ordinary temperatures is given as follows by F. F. Hasbrouck in a recent issue of Food Products, the food in all cases being assumed to be at least slightly acid: 1 lb. of salt preserves 6 lb. of food material; 1 lb. of benzoate of soda, 500 lb.; 1 lb. alum, 200 lb.; 1 lb. acetic acid, 40 lb.; 1 lb. sugar, 1 lb.; 1 lb. glycerol, 4 lb.; 1 lb. alcohol, 8 lb.

TESTING SAIL CLOTH

In order to make certain that sails, especially those for racing yachts, contain no flaws that will cause them to



Testing a Strip of Sail Cloth in a Machine Built Especially for the Purpose

tear under severe strain, the sail cloth is tested by means of the machine shown in the illustration. The strain is applied to a strip of the cloth by means of the long weighted arm or lever, the number of weights on the end of which may be increased or decreased as desired. The scale shows the exact degree of strain exerted on the cloth by the pull of the weighted arm.

MARKING CRIMINALS WITH WAX

A French physician proposes a subcutaneous injection of paraffin wax to identify persons who have a criminal record. His method consists of simply injecting the wax, which is absolutely harmless, under the skin, where it will form a permanent mem-

branous cyst, instead of being absorbed and carried away by the blood. It need not be outwardly visible, but, being situated at a precisely defined spot, its presence will denote a criminal record. Its location may also indicate the nature of the offense.

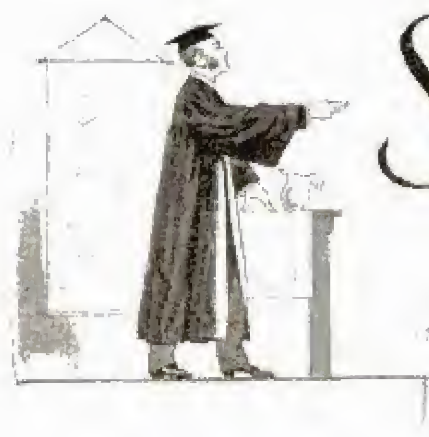
The system, according to the French magazine "Cosmos," is not meant to supplant or supersede the Bertillon recording systems, but to operate in connection with them. Comment is also made upon the possibility of the criminal so marked having the wax removed by an operation without leaving a tell-tale scar.

PAST AND PRESENT IN NEW MEXICO

The accompanying illustration well illustrates the vanishing of the frontier, showing how closely the new order is crowding the remnants of the old. The picture was taken only two or three blocks distant from the business center of Albuquerque, the commercial metropolis of New Mexico. In the foreground is shown a "hogan" of the Navajo Indians, which is occupied by a family of blanket-weavers of that large and powerful tribe. In the background is a modern brick business block, and between the two is a billboard advertising a "Wild West" show—now as much of an attraction in the heart of the erstwhile "wild west" as in any part of the east.



A Navajo "Hogan," a Modern Industrial Plant, and a Wild West Show Poster



Science and Plain English

That Technical Subjects May Be Treated Popularly Without Losing Anything of Value Is the Consensus of Opinion of Many of America's Greatest Scientists and Educators

SCIENCE and mechanics have advanced from the time when they were the hobbies of a few learned philosophers, secluded in home laboratories and workshops, or in the inner retreats of exclusive seats of learning. They have become, in the broadest sense, the principal aids to human progress, and as such they belong to everybody. The labors of the scientist, the inventor and the educator are for the people. Personal gain, in the form of money, advancement or fame, is a secondary matter, although it may, in some instances, form the motive for the work. And after all, it is the productive work of the people that makes it possible for learned men and specialists to discover and invent things that are making this world of ours a better place in which to live.

Unfortunately for the ordinary intelligent person who desires to keep in touch with the world's progress, the various advancements in learning bring along with them a lot of special technical terms to describe new ideas. Some of these terms eventually become almost household words, especially when they are connected with inventions, such as the telephone and the automobile, that are used every day by a large number of people, or the aeroplane, which is so opposed to former knowledge and expectations, that its advent has given rise to a keen popular inter-

est. But, for the most part, this technical language is seldom used outside of the specialized field that called it into being. In many cases, there is a technical term applied to something that already has a popular name, and the mania for specialization has sometimes caused two or more different kinds of terminology, each understood fully only by its own adherents, for the same branch of science. Thus, when there is confusion among even the doctors of learning, it is difficult for the "man in the street" to keep informed.

Nevertheless, it is possible to present scientific and technical material in such a way that it may be understood by the average intelligent person. The difficulty, however, is in finding the people who have the ability or who will take the trouble to do this. Such men as Faraday, Tyndall, Darwin, Huxley and Helmholtz have written fascinating accounts of their great work in plain, unvarnished language. If they used a technicality, a definition was appended or the context explained it. They were scientists of the highest order. They had the style and the simple and easy mode of expression of the finished writer. And, in a great portion of their work at least, they were not above catering directly to the public, both in their writings and their lectures. Are these not examples worth following?

A few weeks ago, a man who has

three university degrees and who was a specialist and a general scientific editor on a great American dictionary everywhere accepted as a standard, attended one of the sessions of The Illinois State Academy of Science, then meeting in Chicago. The subjects discussed were some with which he is not technically familiar, although he is acquainted with them to some extent. With the exception of one lecture, the proceedings were to him absolutely unintelligible. Here was a man whose vocabulary was probably more extensive than that of any scientist present, and yet he was unable to glean anything from all but one of the papers, and this one told him something he had many times observed in walking through the woods near his home. One lecturer even stated that his paper would be technical and uninteresting, which should have been a very excellent reason for not reading it at all.

With the object of obtaining a consensus of opinion on this question of technical English, a number of prominent American scientists and educators were requested to give their views in writing. The letters received, or extracts from them, were as follows:

A. C. True, Director of the Office of Experiment Stations, United States Department of Agriculture:

"The scientific or technical man makes a great mistake when he affects a highly technical terminology in presenting scientific or technical subjects, even before learned societies. Some men have a mania for the invention of technical terms. Such men, as a rule, exhaust their energies in this task and make few real contributions to knowledge.

"The effort to present scientific facts and principles in such language as will be understood by intelligent laymen is in most cases the best means of clarifying the thought of the author on the subject he is treating. While there may be occasions when special themes may be appropriately presented and discussed in highly technical language by

small groups of specialists, the reading of papers of this character before the ordinary scientific society is an absurdity and makes the author a bore. This is a growing abuse and is leading many thoughtful men to doubt the value of scientific societies as at present conducted. It is really the duty of an author to consider the requirements of the audience he is to address and to use his best efforts to make himself intelligible to them. Unless he does this he should not be surprised if he receives a more or less silent verdict that he is an ass. As a rule he is a wise man who makes his oral address a brief summary in as good and simple vernacular as he can command and asks leave to print the details.

"With the abundant opportunity now afforded for the printing of any really valuable scientific or technical material, there is no good excuse for inflicting on scientific or popular audiences masses of details which no human mind can grasp or digest when they are presented in this way.

"Scientific men are often surprised and disappointed because the general public take so little interest in them and their work. If they would take more pains to bring the results of their work to the attention of the public through clear and simple summaries they would do much to remove this popular prejudice."

A. T. Hadley, President of Yale University:

"Looking back as far as I can, it seems to me that the proportion of intelligible and unintelligible matter presented to the learned societies remains about the same; and I am afraid that I cannot attempt to lay down any general laws as to the conditions under which papers should be read by title. It seems to me that this is essentially a matter for each society to decide for itself; and if an inside minority or an outside majority do not like the decision, they have a simple remedy—they can stay away."



Dr. A. T. Hadley, President, Yale University,
New Haven, Conn.

"It seems to me that the proportion of intelligible and unintelligible matter presented to the learned societies remains about the same . . . This is essentially a matter for each society to decide for itself."

Prof. A. A. Michelson, Chicago University:

"The proceedings of a scientific society are not intended for the layman and should not be criticized from his viewpoint. I, nevertheless, quite agree that scientific subjects can and should be so presented that the layman may get the benefit."

Charles W. Eliot, Former President
Harvard University:

"Most branches of science now possess nomenclatures and technical languages of their own, each of which is intelligible only to those who study that particular branch. Accordingly, in a learned society which gives attention to many sciences, scientific papers on one subject are apt to be unintelligible except to students of that subject. This is one of the gravest difficulties of scientific societies at the present day. It results from the great division of labor and narrow specialization within each



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of the several sciences. It is very difficult at the present day to write clearly and accurately about a scientific subject for popular reading. Michael Faraday, John Tyndall, and Charles Darwin succeeded in doing that; but within twenty years past the task has much increased in difficulty, because the rapid progress of applied science has made necessary a large number of new terms and new conceptions.

"I have never been a popular lecturer on scientific subjects, and have had no occasion to consider in my own practice the means of making difficult scientific conceptions understood by a popular audience; but I have a firm conviction that teaching through the eye by the use of diagrams, lantern slides, models, and so forth, is an invaluable adjunct in popular lecturing. That method of teaching should also be used in schools to a much larger extent than it is now. Great masses of facts can be compactly and intelligibly

presented in a diagram, when tables of numbers representing the same facts would be almost unintelligible."

Prof. David P. Todd, Amherst College:

"I quite agree that it is very little use writing things in words which one's readers can fairly be supposed unable to understand.

"The famous mathematician, Sylvester, used to say that he never felt sure of any mathematical result attained at the end of remote analytical formulæ until he had gone over it so thoroughly in all aspects in his own mind that he would be able to make it absolutely intelligible to the first man he might button-hole in the street.

"Tyndalls and Huxleys, I am inclined to think, are made, not born; I wish we had more of them. Certainly it is a much more difficult thing to write an untechnical article than a research paper, but I often think it is much more worth the doing."

Prof. Henry C. Cowles, Chicago University:

"It seems to me that it is quite proper for scientific organizations to give technical papers . . . but only before those whose technical training fits them to profit from such meetings. I also believe that a distinct mission of these organizations should be to have other meetings at which the results of research should be presented in a non-technical manner, and thus made available for colleagues of sister sciences and the laity in general."

Prof. W. A. Noyes, President, the Illinois State Academy of Science:

"I am heartily in sympathy with the endeavor to make certain phases of scientific work intelligible to the public. There must always be, however, many portions of our work which is a closed book to many persons, who have not the knowledge to understand it."

Prof. J. A. Udden, Vice-President, the Illinois State Academy of Science:

"I am decidedly of the opinion that the principal contents of most scientific papers may be rendered in lan-

guage that is intelligible to people of general culture . . . The best interests of all would be promoted if a synopsis were given by authors of papers, stating in the least technical language possible the main results and the character of the investigations reported."

J. R. Mohler, Chief of the Division of Pathology, Bureau of Animal Industry, United States Department of Agriculture:

"That the most salient features of a scientific work may be presented in every-day language and still retain the original worth of the article has been repeatedly demonstrated in instances in which farmers' bulletins have been prepared from scientific bulletins, and although somewhat shorter than the original work, these farmers' bulletins have been in great demand for distribution among the farmers, and have been gladly and profitably read by those who have obtained them."

Prof. R. T. Salisbury, University of Chicago:

"I know some foreign societies which have open sessions and technical sessions. At the latter, technical papers may be presented technically, but a large attendance is not expected. There is, in some quarters, a curious and pedantic prejudice against the popularizing of scientific matter . . . I think this prejudice is diminishing, and that it is now much less general than it was twenty years ago."

Prof. Henry Crew, Northwestern University:

"It seems to me highly desirable that editors of popular magazines should obtain clear, simple, straightforward, untechnical presentations of the best scientific work of the day."

Prof. G. L. Kittredge, Harvard University:

"It is not merely the use of technical terms that causes the difficulty. It is also the fact that most scientific writers give themselves little concern about style."



Dr. A. A. Michelson, Professor of Physics, Chicago University, Chicago, Ill., Nobel Prize Winner

"I quite agree that scientific subjects can and should be so presented that the layman can get the benefit."

Prof. T. C. Chamberlin, Chicago University:

"Let the press of all kinds and grades write up science for the devotees of science, just as they write up golf for the devotees of golf, sport for the devotees of sport and so on, and for **no others** (the emphasis was made by the writer quoted)—except as kindergarten stuff for learners, proffered with due warning of the fact, and an apology."

Prof. L. V. Pirsson, Yale University:

"There are occasions and audiences where one is justified in the fullest use of technical language—others where it would be obviously improper."

Prof. E. S. Sheldon, Harvard University:

"The writer of an article to be read to an audience ought to consider his audience, and try to make his paper intelligible to the hearers he expects to



Dr. Chas. W. Eliot, Former President, Harvard University, Cambridge, Mass.

"I have a firm conviction that teaching through the eye by the use of diagrams, lantern slides, models, and so forth, is an invaluable adjunct in popular lecturing."

have. If his audience consists of scholars in his own line of work, I think he should present his results clearly and in good English, if he can. If he can likewise make his paper intelligible to possible hearers not at home in the technicalities of the subject, so much the better, and this, at least to a considerable extent, I believe can be done, often with no sacrifice of anything important to scholars."

Prof. E. S. Dana, Yale University:

"There is no question but that scientific investigations must be carried forward on high lines in order to be thoroughly successful. Papers describing the results of work in pure science as originally published are undoubtedly unintelligible to the mass of readers, and indeed would not be worth publishing if this were not the case; at the same time, in a great many instances, it is practically possible for one conversant with the facts to present them

in such a form that the intelligent reader can get the gist of the matter and see what progress is being made. With the common attempt now-a-days to popularize science in this way I am entirely in sympathy."

Prof. W. B. Smith, Tulane University:

"The authors (of highly technical papers) wish to appear, and even actually to be, learned and original, to widen the spirit of light and knowledge, and it is easiest to do this by some form of research into neglected trifles, which indeed sometimes have extreme value, but in general make but small contribution to our intelligence or comprehension of the universe."

Prof. L. R. Jones, University of Wisconsin:

"I do think that it is possible to prepare in all cases a descriptive article upon any technical subject which can be understood by any intelligent person. I do not think, however, that it is practicable in all cases to make such a paper a synopsis of a technical account. Certainly no public audience could properly understand the technical details which are often the things of primary scientific importance."

It will be noted that the distinguished heads of two of the bureaus of the United States Department of Agriculture come out unequivocally for nontechnical English, while some of the college professors are more or less "on the fence" so to speak. The reason is obvious. All of the professors are not yet emancipated from the narrow associations of college life and learning. The government agricultural scientists, on the other hand, are working directly for the people, and the United States Department of Agriculture is doing the most valuable work ever undertaken for the people of America, and this cannot be put too strongly.

Undoubtedly there is much written in the guise of science that were better left undone, but this is no reason why the intelligent and educated layman should be classed as a being apart from our "men of high degree." The world is interested in its scientists. The world supports them. It is vitally concerned in the results of their labors—then has it not a right to know what is going on for its welfare, and how can it comprehend the results if they are hidden in a language that is harder than Greek to understand?

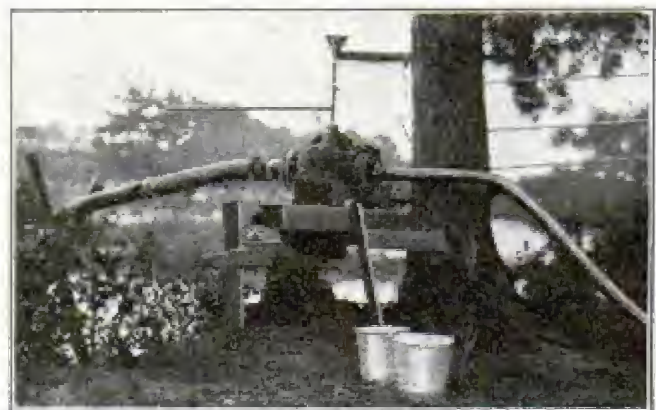
ELECTRIC PUMP IN QUICK EMERGENCY SERVICE

The quickness and determination characteristic of the truly efficient engineer were strikingly exemplified in an emergency pumping service recently installed for the city of Phoenix,

Ala., when the regular pumping plant went out of commission during a spell of dry weather. About 1,000 ft. away from the pumping station there was found a small stream having a flow of



The Intake from the Dammed-Up Stream



The Motor-Driven Pump, and Intake and Delivery Pipes

250 gal. per minute. In less than 24 hours the stream was dammed up, a motor-driven pump was put in service, and a $2\frac{1}{2}$ -in. fire hose was supplying water to the city for drinking and fire purposes. The service wires from the old pumping station were run across a cotton field and hung on fence posts and the limbs of trees, and in spite of the hurry-up nature of the work, the temporary installation proved quite capable of supplying the needs of the occasion.

CHURCH CONVERTED INTO ELECTRIC LAUNDRY

That "cleanliness is akin to godliness" is strikingly illustrated in the conversion of a church in Baltimore into an up-to-date and enterprising laundry.

Not only is electric light used to illuminate the interior of the edifice, but all the flatirons are electrically heated and the machines are driven by electric motors.

The original power equipment consisted of a 75-hp. steam engine driving a 50-kw. dynamo, but increasing business has necessitated the recent addition of a 150-hp. steam engine, a 100-kw. dynamo and a 200-hp. boiler, besides several machines in the laundry department.

MODEL BARRACKS IN FRANCE

The new barracks occupied by an infantry regiment, located near one of the gates of Paris, are far in advance in comfort, sanitation and hygiene of



French Soldier Surveying Himself in a Large Mirror Placed on the Outer Wall of His Quarters

anything of the kind ever before erected in France. Each company has separate wash and toilet facilities and a fully equipped barber shop, and when the soldier emerges from his quarters, he can survey himself in a large mirror set in the outer wall near the door, to see that his uniform is spick and span.



Once a Church, Now an Electric Laundry



View in the Ironing Department



Fine Example of Open-Air Fireplace

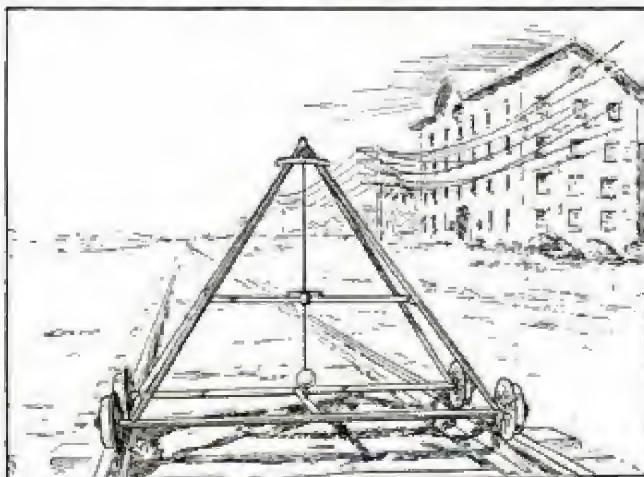
PORCH FIREPLACE

A fine example of porch fireplace is shown in this illustration. The exposure of the porch is southern, and the fireplace makes it comfortable at least

a month earlier in the spring and a month later in the fall than would be the case if a fire were not available. It also serves on cool or damp evenings.

COMBINED TRACK GAUGE AND LEVEL

An ingenious combination track gauge and level has been designed by James J. Hill, the great railroad builder. It consists of a rectangular base built



Ingenious Combination Track Gauge and Level,
Designed by James J. Hill

of steel tubing and mounted on four 6-in. wheels. The distance from flange to flange is exactly the track gauge. On this base, a pyramid of steel tubing is built, with a cross bar at about one-half the height, to which a spirit level is attached. A pendulum, with the lower end weighted and the upper end running to a point and moving along the arc of the circle, which is fastened to the frame near its top, is pivoted on the same cross bar to which the spirit level is attached.

When the device is on a level track, the pendulum points to zero, the arc of the circle being so graduated that the difference in elevation of the two rails is correctly indicated on the dial, the smallest reading being 0.2 in. By pushing the apparatus over the track, the operator is able to check the gauge,

while the dial reading indicates high or low spots on a straight section of track, or the elevation on curves. Over 30 of these instruments are being used on the LaCrosse division of the Burlington road.

INTENSE COLD AT HIGH ALTITUDES

Temperature and barometric pressure instruments attached to a parachute and sent up by balloon from the Toronto meteorological observatory, Feb. 3, were recovered in March. The recording instruments showed that the balloon reached a height of $7\frac{1}{2}$ miles before it burst, and that the temperature was 90 below zero.

It is said that $7\frac{1}{2}$ miles is the highest mark at which temperature has ever been recorded in America.

LESSENS FIRE RISK AND PREVENTS LAMPS FALLING

This new electric lamp socket has separate inlets for its leading-in wires, a feature which practically eliminates any danger of short circuits and consequent blowing of the fuse and possible fires.



FISH YAWN LIKE HUMAN BEINGS

An English biologist has observed a certain action in fish, which is, according to him, an exact counterpart of the yawn of a human being, and serves the same physiological purpose.

A person yawns during periods of depression, such as sleepiness, the physiological reason for and purpose of the yawn being to stimulate the brain by carrying to it an abnormally large amount of blood. The yawning of fish is said to occur especially when the water is slightly heated and therefore contains less air in solution.

ENOUGH OIL TO FLOAT THE UNITED STATES NAVY

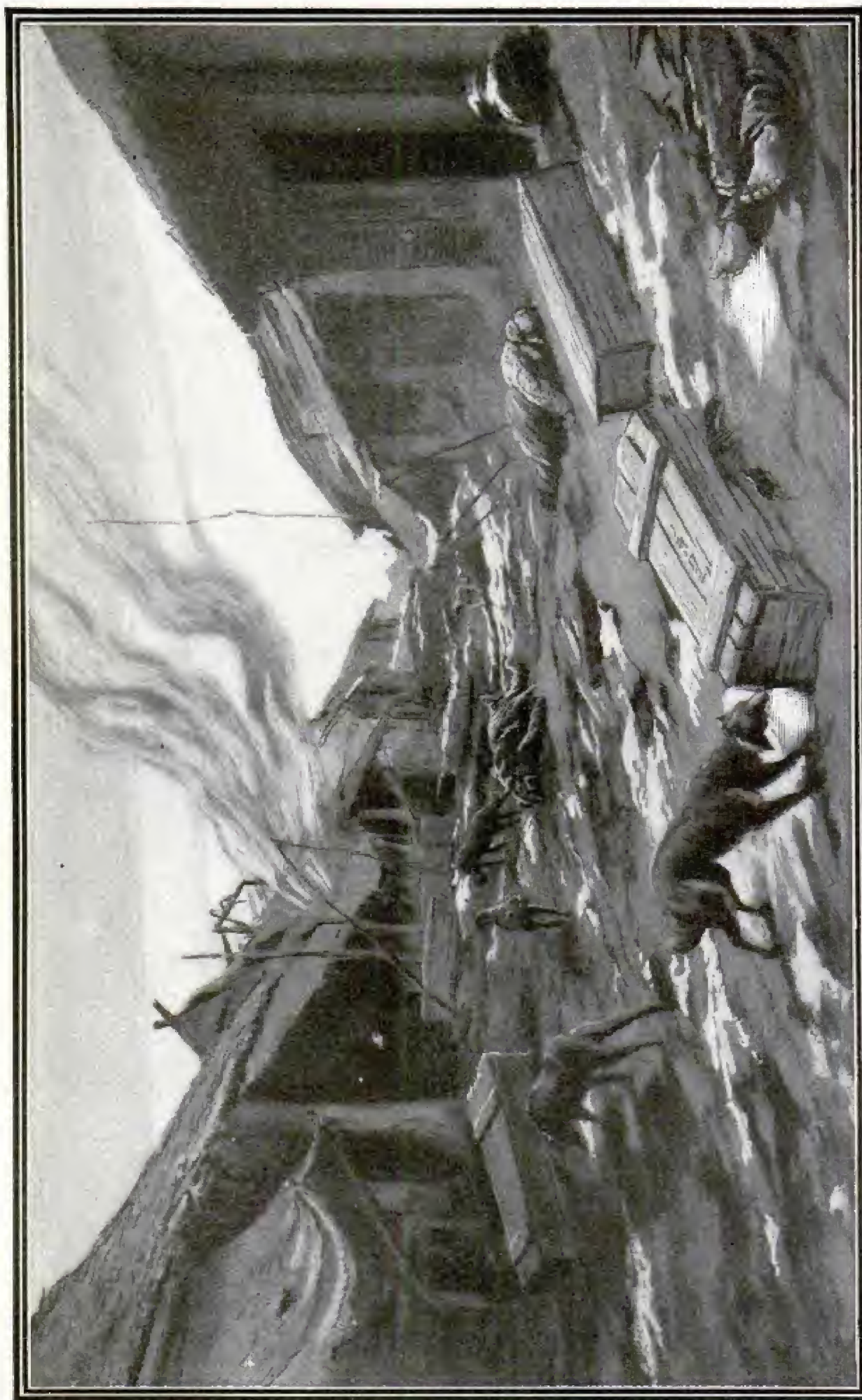
The oil produced last year in this country would easily float the entire



The United States Army Could Easily Stand on the Head of This Barrel, Which Would Hold the Oil Produced in This Country Last Year. The Eiffel Tower, the Highest Structure in the World, Is Shown for Comparative Size

United States navy and leave considerable room for the vessels to maneuver into position. In actual amount it was estimated at 216,588,308 barrels (42 gal. to barrel). A reservoir 40 ft. deep, big enough to contain this quantity of oil, would have an area of over one square mile. If the oil were put into a barrel of the usual proportions as to height and diameter, such a cask would be about 1,500 ft. high. The head of this barrel would be 975 ft. in diameter, and have an area of about 17 acres, or enough space to accommodate very easily the whole of the standing army of the United States.

The total oil production last year of the entire world was about 340,600,000 barrels. A barrel to hold this oil would have to be about 1,750 ft. high.



Courtesy L'illustration

TOWN IN MANCHURIA DESOLATED BY THE PLAGUE; ANIMALS FEEDING UPON THE VICTIMS

THE PLAGUE IN MANCHURIA

The origin of the plague responsible for thousands of deaths in the Chinese cities of Manchuria, desolating whole towns, is attributed to a rodent resembling the kangaroo, with long hind legs and coarse hair. It is said that a hunter was inoculated with the plague bacilli from one of these animals, which are very common in Manchuria, and that the epidemic spread with incredible rapidity from this source.

The plague in its present form is much more virulent than the ordinary bubonic plague, and any one seized with it succumbs in from 30 minutes to three or four days at the longest. The description of the ravages of the plague in Fuchiatien, as reported by a Russian correspondent in Harbin, is applicable to many other small Manchuria towns. This correspondent says that Fuchiatien has become a dead city. Streets are deserted, the houses empty, the bazaars closed. The dogs and rats that devour the corpses of the victims are the only evidences of life. Even the hospitals are empty, both physicians and patients having been stricken.

The character of this plague is pneumonic, consequently it may be communicated by the breath of a victim and acts with crushing speed. One reason for its rapid spread was the failure of the Chinese government to provide adequate means for checking it. Viceroy Hsi, after pressure had been exerted by the diplomatic corps, finally adopted radical measures and cooperated with the Japanese authorities. After considerable hesitation and delay, about 2,000 infected bodies were cremated instead of being buried, this being the first radical step. Then 1,000 soldiers were dispatched to Fuchiatien to enforce strict quarantine, as the plague was spreading more rapidly there than anywhere else. The Chinese coolies were quite indifferent to the dread disease. They objected to their bodies being examined and smuggled themselves away in the



Courtesy Illustrated London News

Fumigating the Hold of a Ship at London, as a Means of Exterminating Rats, Which Might Possibly Spread the Plague

night, thus carrying the plague to the southern provinces.

Fear that the epidemic might find its way to Europe and America has resulted in great precautions being taken at every port. One of the illustrations shows a floating fumigating plant pumping sulphur dioxide into the hold of a vessel as a means of exterminating rats, which might possibly spread the plague.

BIRD BREAKS CLEAN HOLE THROUGH WINDOW

Evidence of the terrific speed of the quail when on the wing is found in a window pane 42 in. square, in West Virginia. The quail was flying from a hawk and mistook the window of a house for an open space that showed a way of escape. The bird smashed through the glass, making a clean hole, such as would be made by a bullet. It



Window Through Which a Bird Flew

was dead when picked up, its head being almost severed from its body. The hole made by the bird is just a little larger than its body.

OLDEST LIGHTHOUSE IN AMERICA

Boston light, which stands on Little Brewster Island, at the outer end of the channel which ocean liners follow, about eight miles below the city, is claimed to be the oldest in America. The lighthouse itself, which is of rough boulder stone hooped with iron bands, was built in 1715 by the government of England. An old cannon, still lying on the ground near its base, was provided by the Cunard company to give signals before the fog horn was installed.

The families of the head keeper and his two assistants, and a school teacher provided by the town of Hull in conjunction with the state, live at the light, numbering 12 inhabitants in all. The school room in which the five children study and recite is on the top floor of the head keeper's house and looks out in all directions upon the sea.

THE HERMIT AND THE OIL CANS

There are a few things to be said in favor of Standard Oil, after all. The modern hermit would find himself

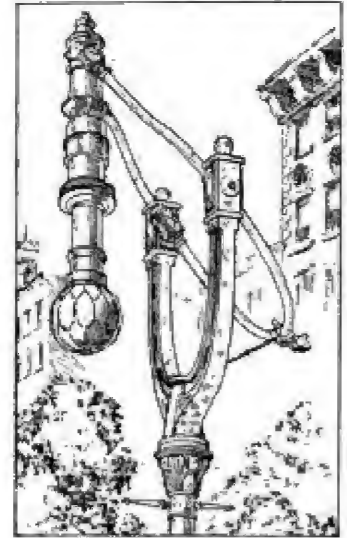


The "Nature Man" Above His Oil-Can-Roofed Abode in the Hills Back of Papeete, Tahiti

badly handicapped, especially in the tropics, were it not for the tin cans which that organization furnishes to the ungrateful world. Ernest Darling, a disciple of the simple life, well known in San Francisco, Los Angeles and the Honolulu islands, lately residing in the South Sea island paradise of Tahiti, in the French colony of Oceania, thought it expedient to cover his Robinson Crusoe shanty with a roof made from straightened Standard Oil cans; and as he dreams of an individualistic and vegetarian colony on the plantation into which he turned a jungle, 1,200 ft. above the wicked town of Papeete, he accumulates a new supply of that roofing material on the resting places along his usual trail, to be brought up to his "mountain home" when he is not overburdened, on his return from the English lessons he gives to a few Chinamen in Papeete.

ARC-LAMP CARRIER FOR STREET LAMP-POSTS

The novel feature of the arc-lamp carrier shown in the sketch is the central harp which permits the lamp to be hung vertically over the standard and to be swung to one side so that it may be lowered to the ground for trimming and cleaning.



A weather hood protects the lamp to some extent from rain and snow.

MEXICAN CAPITAL IS A CITY OF CONCRETE

The City of Mexico, nestling on the floor of a wind-swept, treeless tableland 7,140 ft. above the level of the sea, might justly be termed the world's first and largest city of concrete. For more than four centuries practically every building in the city has been constructed of concrete or brick. Wooden structures are so rare that they are curiosities, and brick is almost as scarce as wood. The peculiar location of President Diaz's capital, with its population of almost half a million and its acres of homes and business blocks, partly surrounded by mountains rising from 10,000 to 16,000 ft. above sea level, makes wood in all its forms one of the scarcest articles of commerce. Brick clay is not found to any extent in the vicinity of the city, while lime and sand are in abundance. Concrete is cheaper in Mexico City than anywhere else in the world and, as a result, practically all of the building in the city has been done with this material.

Some of the buildings in the city are

magnificent from the point of view of the artist as well as the builder, and further than this, are constructed of material that makes them impervious to the heavy rains, proof against the most severe earthquakes and firm as solid rock against the fierce blasts of the tempests that sweep down from the northwest coast. All the government buildings, the business structure and the private residences of any consequence are built of this native material reinforced with steel. The postoffice is one of the finest buildings of this character in North America and cost the government \$7,000,000 Mexican (about \$3,500,000). It could not be duplicated in the United States for anywhere near that sum. The National Theater, which has been building for the past six years and is not yet completed, is to cost \$25,000,000 Mexican (about \$12,500,000), and is constructed of reinforced concrete and marble. The building is faced on the outside with the finest Italian marble. It rests on a raft of concrete and railroad ties sunk



Two Examples of Concrete Construction in the Residence Section of Mexico City—The House in the Fore-ground is Built of "Imitation Stone" Blocks Made of Concrete—The Building on the Right, Which Shows Almost Pure White, Is of Concrete without Steel Reinforcement.

30 ft. in the ground. The palace of the president is a magnificent structure in which the ornamentation, as

well as the walls and partitions, is of concrete, designed to endure forever. The water supply of the city is



Avenida de Diez y Seis Septiembre, Mexico City, One of the Principal Business Streets of the Capital—Every Building on It Is Concrete, for the Most Part without Reinforcement

through concrete aqueducts. The same system of supply has been in vogue 400 years, but it has been improved in detail from time to time and is quite in keeping with modern re-

quirements. The water is brought from Monterey, on the northern border of the republic. The huge aqueducts are carried over hill and valley on concrete bridges where necessary.

TICKETS MADE WHILE YOU WAIT

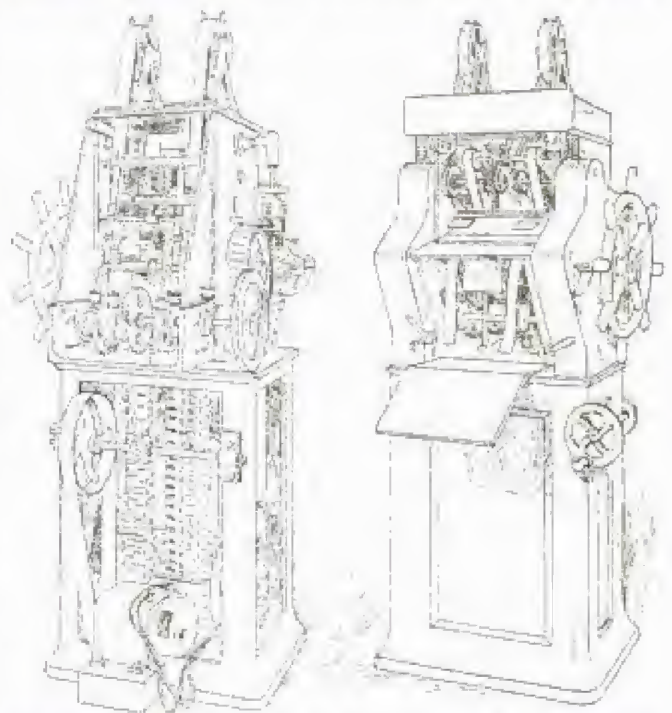
The spacious ticket case, as a form of mural decoration in the station agent's office, seems threatened with extinction by the new type of ticket-printing machine recently installed at the Brooklyn terminal of the Long Island Railroad. The machine, which prints the complete ticket on the spot, is of French manufacture and is at present the only one of its kind in this country.

Roughly, the operation may be described as follows: A series of electrotype blocks are arranged upon an endless belt, facing outward. By turning the sidewheel, the belt is moved at will and the required block brought into printing position, this being indicated by a pointer which travels simultaneously along a white face on the upper part of the machine, whereon are printed the names of the stations. The block having been set, an electric switch is thrown in and starts a motor at the base of the machine. The balance of the operation is automatic, for the motor drives a most complicated set of mechanism which feeds down the paper, makes the impression, numbers the ticket, cuts it off and delivers the finished product. Coincidentally with the printing, the machine records on two slips full information of the sale, for the agent's record and the accounting office. Still further, dials upon the face of the machine show the total number of tickets turned out.

In this type, two kinds of thin cardboard stock are used on the rolls of unprinted material at the top—blue for express tickets and yellow for local—and separate records of each are kept automatically. There is a considerable latitude in the possible speed of production, the present speed of 65 tickets

per minute, or a little less than one second for the complete manufacture of each ticket, being far below the capacity of the machinery.

The device saves space by rendering unnecessary the printing of a supply



Front and Rear Views of Machine to Make Railroad Tickets While You Wait

of tickets, and time in selecting pasteboards from a rack and dating them. It spares the agent from one to two hours' work in preparing his report after the day's business, for his account is made up with mechanical accuracy and his cash must tally with the totals printed on the slips at the end of his tour. The public is protected by the automatic printing of the price of the ticket upon its face.

¶The Chinese government is considering plans to extend its wireless system to connect the principal ports with the capital of the empire.



Victoria Falls, Zambesi, Africa, the Greatest Waterfall in the World, from the Painting of Edward H. Houlder

TEST GYROSCOPE AS WAR VESSEL STABILIZER

The naval authorities are perfecting plans for extensive tests of the gyroscope as a means of promoting the stability of vessels of war. Much faith is expressed in the mechanism, which has been under examination by high naval officials. It is intended to install the gyroscope on board one of the older torpedo destroyers, and to conduct a series of tests which will show, under conditions of actual service, the demands made on a vessel in the way of weight and space. The experiments will be conducted this summer.

¶The Commonwealth Edison Co. of Chicago was astonished recently at the courtesy and ingenuity of one of its customers. The meter reader was unable to obtain access to the premises, owing to this customer's absence during the greater part of the day, therefore the customer made a photograph of the watt-hour meter and maximum-demand indicator and sent it in.

FIRST PAINTING OF WORLD'S LARGEST WATERFALL

The first painting ever made by a professional artist of the Victoria Falls, on the Zambesi, in South Africa, is that reproduced in the accompanying photograph. To make it, Edward H. Houlder, famed in Europe for his large and beautiful landscape pictures, had to make a journey of 7,700 miles, that being the distance from his home in London to Cape Town and from the latter place to the Falls.

These falls were first discovered by Livingstone in 1855, and named after the late Queen Victoria. They are situated in Southern Rhodesia at a height of no less than 2,300 ft. above the level of the sea. They are over a mile in width, more than double that of Niagara, while there is a sheer drop of over 400 ft. against Niagara's 187 ft. This wide sheet of water descends into a narrow chasm and rushes through a small outlet into a narrow zigzagging gorge for a distance of nearly 40 miles.

EFFECT OF WATER IN WATER-PROOFING CONCRETE

It has long been recognized, according to C. M. Chapman in a paper read before the National Association of Cement Users, that the quantity of water used in mixing concrete has a large influence upon the impermeability of the resulting mass. A concrete may be too wet or too dry to produce the most impermeable product, and one extreme is as bad as the other. The theory is generally held that, other conditions being the same, a wet mix makes a more waterproof concrete than a dry mix, as the latter produces a more porous mass, unless very tightly compacted by much hard tamping or enormous pressure. A slight difference in the percentage of water used will make a large difference in permeability.

HAMBURG'S TRAFFIC AND PEDESTRIAN TUNNEL

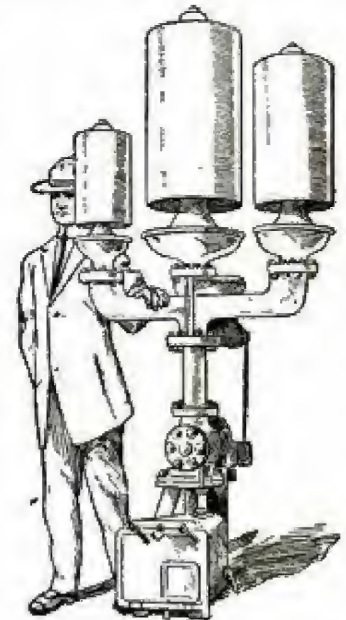
The double tunnel which has been in process of construction for the past three years under the River Elbe at Hamburg, Germany, will be opened this year. It is about 1,500 ft. long and the cost of the two bores will be close to \$2,500,000. Each bore has a roadway for automobiles and other wheeled traffic, and two footpaths. One bore is used for the up traffic and the other for down traffic.



One of the Bores of the New Double Tunnel Under the River Elbe at Hamburg, Germany

THE "OLYMPIC'S" WHISTLES LARGEST EVER MADE

The whistles of the "Olympic" are the largest ever made. Each set, of which there are two, one on each of the forward funnels, consists of three bell domes, 9 in., 15 in. and 12 in. in diameter, grouped together on a branch piece. The height from the base of the branch piece to the top of the center dome is 4 ft. 2½ in., and the combined weight of the three domes and the branch piece is 764½ lb.



The whistles, which are electrically controlled, are so arranged and tuned as to give the distinctive harmonious blast which is known by the White Star line navigators as their own recognized sound.

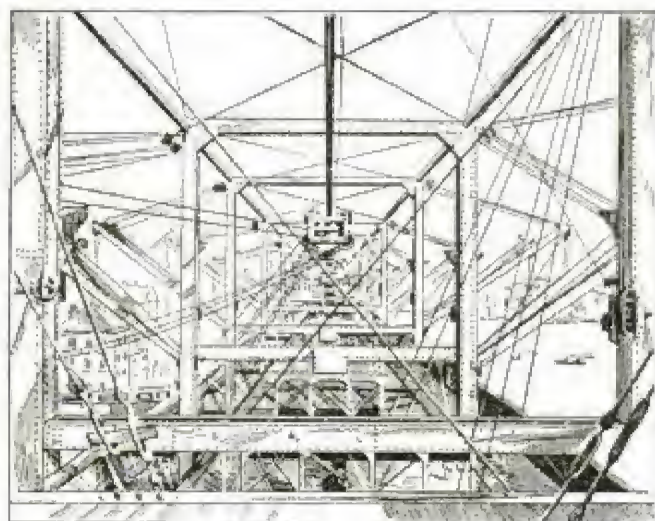
TRACKLESS TROLLEY FOR LEEDS, ENGLAND

The corporation of Leeds, Eng., is operating a trackless trolley or trolley omnibus line over a mile of streets and will extend the route to a length of four miles. The omnibuses, which are single-deckers provided with cross seats accommodating 28 passengers, use the ordinary trolley wires for positive current, and additional wires, one on a side, for the negative return. This part of the overhead equipment is supported by side poles and bracket arms.

Both the exit and entrance to the trolley omnibuses are at the front, and the motorman takes the fares. Unless the traffic becomes exceptionally heavy, conductors will not be employed.

COALING GEAR OF U. S. COLLIER

The coaling gear of the U. S. N. collier "Cyclops," as viewed looking forward from the stern, might be taken



Steel Structural Work Rising Above Deck of the U. S. Collier "Cyclops"

ward from the stern, might be taken for the steel skeleton work of a building. It consists of 14 steel masts or upright supports, arranged in pairs and connected by fore-and-aft and cross ties, giving a clear deck for the operation of the unloading gear. The foremost and aftermost pairs of upright supports are really masts, being carried

up twice the height of the others and rounded off. Each upright, with the exception of the four just mentioned, carries two steel crane booms.

The "Cyclops" has a length of 542 ft. over all, a beam of 65 ft., and a coal-carrying capacity of 12,500 tons. She is capable of handling coal at a rate of 1,440 tons per hour.

AN ADVERTISING CLOCK THAT TALKS

An electric clock that operates display advertisements and attracts attention by shouting to passers-by is one of the latest advertising devices.

This timepiece resembles a mission-style grandfather's clock. In front of the lower part of the case are 30 advertisements which are changed at regular intervals by an electrically operated mechanism. Above this and below the clock proper is a phonograph which can be made to say anything in the manner of the most expert "barker," or to entertain an audience, if desired, with the latest musical selections. The principal advertising value of the device lies in its novelty.

DISCOVERY OF AMERICA CAUSED BY A BUG

A bug, similar in many respects to the cockroach of our day and time, is believed by some historians to be responsible for the discovery of America.

This information is contained in an article, written by the Rev. Alexander Darley, a native of California, who has been engaged in historical research in the Orient. He states that the continent of North America was discovered 17 centuries before Columbus sailed on his memorable voyage by a Chinese mariner named Hee Li who landed on the Pacific coast, June 10, 217 B. C., near where the city of Monterey, California, is now situated. Authentic data has been obtained to prove this assertion, it is claimed, and also to prove the influence of the bug on the opening of transpacific commerce at a

time when Christianity was unheard of. Hee Li was captain of a junk that was caught in a typhoon off the coast of China, according to this version of the discovery of America. A bug took refuge from the storm in the compass of his ship and so disarranged the apparatus that the sturdy seaman, in following its direction in the manner to which he had been accustomed kept his vessel headed east instead of the way he intended to go and after many days landed on a new continent. It was not until after he had made land that he discovered something to be wrong with the compass and then the bug was found.

Traces of Chinese visitations are to be found in California, Peru and Alaska, according to the savants who

have been investigating the subject. The village of Eten, Peru, contains a number of people who speak a language that is not understood by the other peoples living in the vicinity, but is easily translated by Chinese coolies who have visited the place from time to time. Chinese characteristics are found among the Digger Indians of California and there is a strong resemblance between the Alaskan Indians and the Chinese. Captain Hee Li returned to China with the news of

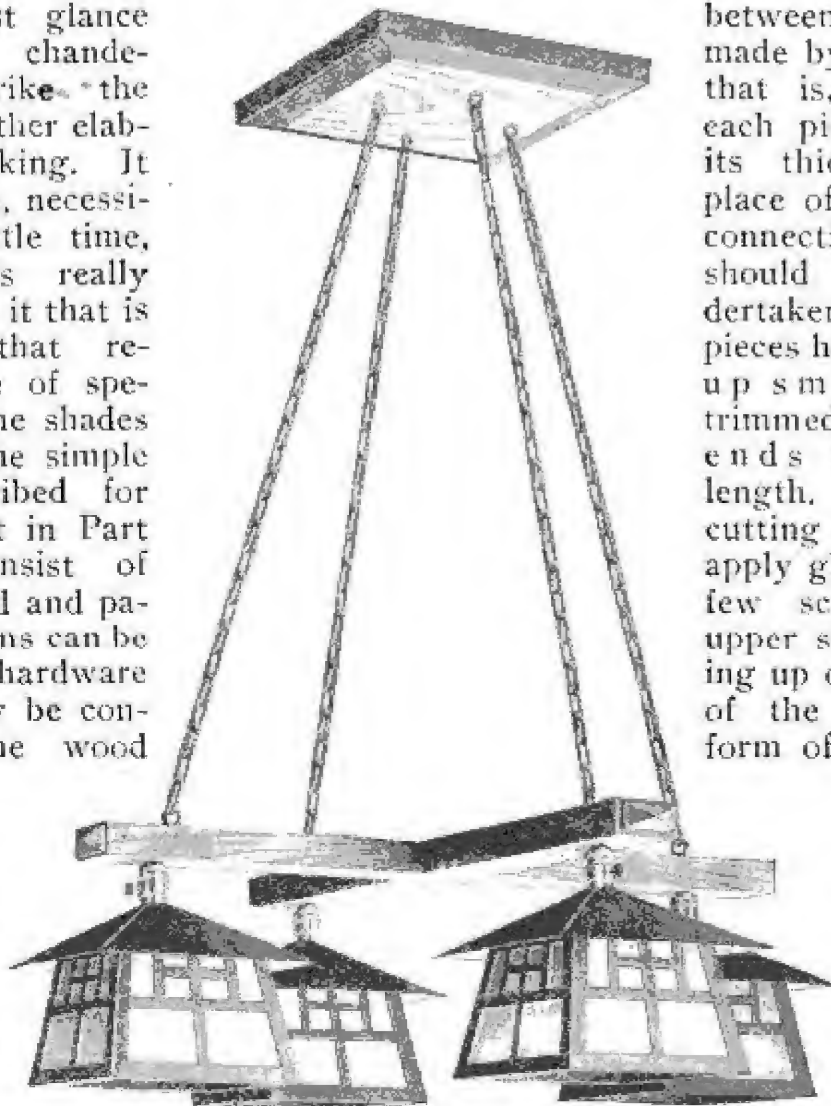
his discovery and for more than 100 years boats plied between the Pacific coast of America and China. No attempt was made, apparently, to colonize the new country and no reason for this failure is brought forth by the records. The commercial intercourse between China and the Americas was simply allowed to die. Buried in the musty recesses of some Chinese library there may exist today a complete story of what the Chinese found on the Pacific shores.

THE MAKING OF ARTS-CRAFTS LAMPS

By JOHN D. ADAMS

PART X—FOUR-LIGHT, CHAIN-HUNG CHANDELIER

At the first glance this mission chandelier will strike the reader as a rather elaborate undertaking. It will, of course, necessitate some little time, but there is really nothing about it that is difficult or that requires the use of special tools. The shades used are of the simple pattern described for the drop light in Part IX, and consist of only cardboard and paper. The chains can be had at any hardware store and may be connected to the wood with screw eyes or staples. The wood work consists of two pieces of dressed 2 by 4-in. pine in the form of a cross, the connection

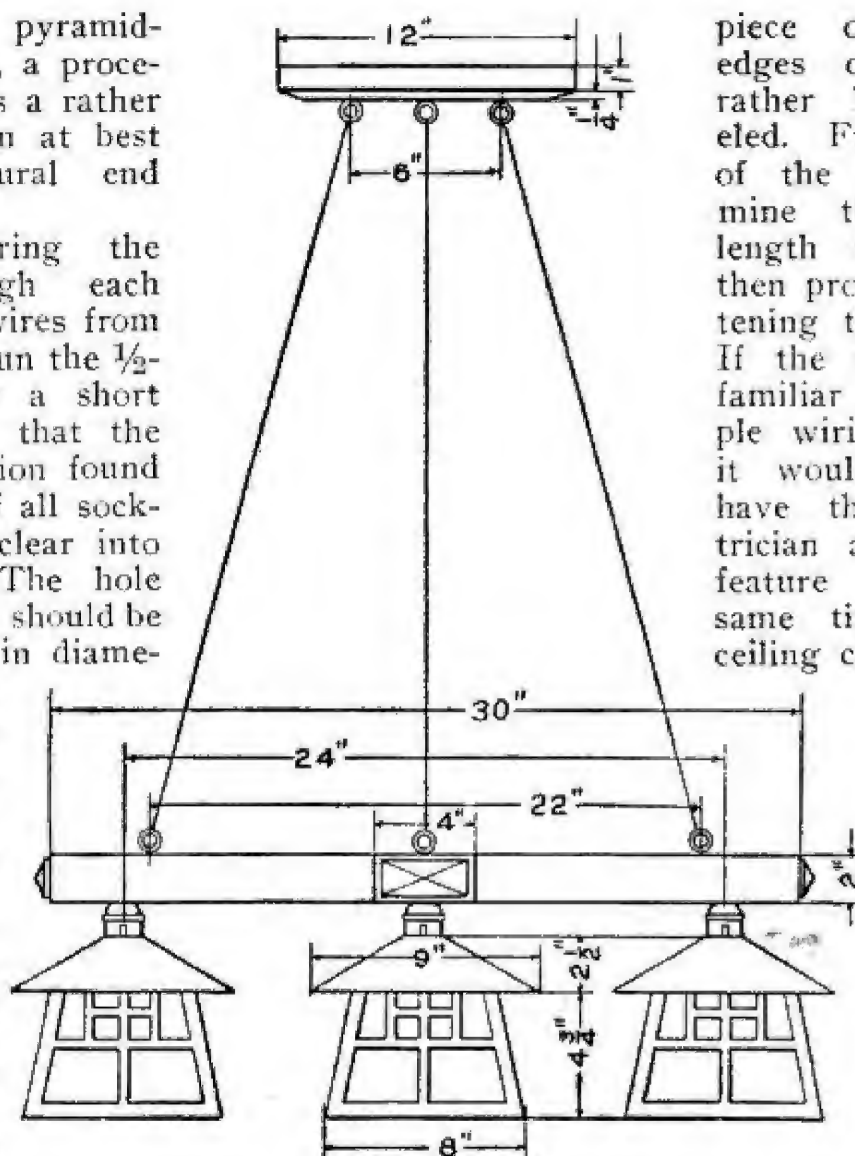


Four-Light Chandelier

between the two being made by cross lapping, that is, notching out each piece to one-half its thickness at the place of crossing. This connection, however, should not be undertaken until the two pieces have been planed up smoothly and trimmed off on their ends to the exact length. When all the cutting has been done, apply glue and set in a few screws from the upper side. The shaping up of the four ends of the cross, to the form of the dull point as shown, means some little labor, which can only be avoided by sawing off each end perfectly square and then tacking

on a small pyramid-shaped block, a procedure which is a rather poor deception at best of the natural end wood.

Before boring the holes through each end for the wires from the sockets, run the $\frac{1}{2}$ -in. bit in for a short distance, so that the $\frac{1}{2}$ -in. projection found on the top of all sockets will set clear into the wood. The hole for the wires should be about $\frac{1}{4}$ in. in diameter, and is to be plugged up tightly from above with a wooden peg after the wires are in place, so that the socket will be held firmly. The ceiling plate consists of but one



General Dimensions of Chandelier

piece of wood, the edges of which are rather liberally beveled. From the height of the ceiling determine the necessary length of chain, and then proceed with fastening them in place. If the reader is not familiar with the simple wiring necessary, it would be well to have the local electrician attend to this feature and at the same time make the ceiling connection. All

this, however, should be attended to before the shades are attached to the sockets.

The lead wires may be run through the links of one of the chains.

AUTOMATIC EXTINGUISHER SUFFOCATES FIRE

An automatic fire alarm and extinguishing system, which puts out fire by suffocating it with carbonic-acid gas, has been tested with excellent results by the fire departments of Kiel and Hanover and on a German warship.

The apparatus consists of two distinct parts, one being the extinguisher, which is a generator of carbonic acid, and the other an electric alarm. The generator is a galvanized-iron tank partially filled with a solution of potash. Its cover has a cap so constructed as to intercept any of the fluid, while the generated gas freely passes out through perforations. In-

side of the tank is a cast-iron reservoir filled with concentrated sulphuric acid, the top being perforated with several small holes. This reservoir rests on a horizontal shaft, having at one end and outside of the tank a lever held in a horizontal position by a catch attached to the armature of an electromagnet. The passing of an electric current energizes the magnet and releases the lever, the reservoir is overbalanced, and the sulphuric acid drips down into the solution of potash, generating about 500 cu. ft. of carbonic acid gas in 25 to 30 seconds. The gas is forced out of the generator under pressure, and smothers the fire.

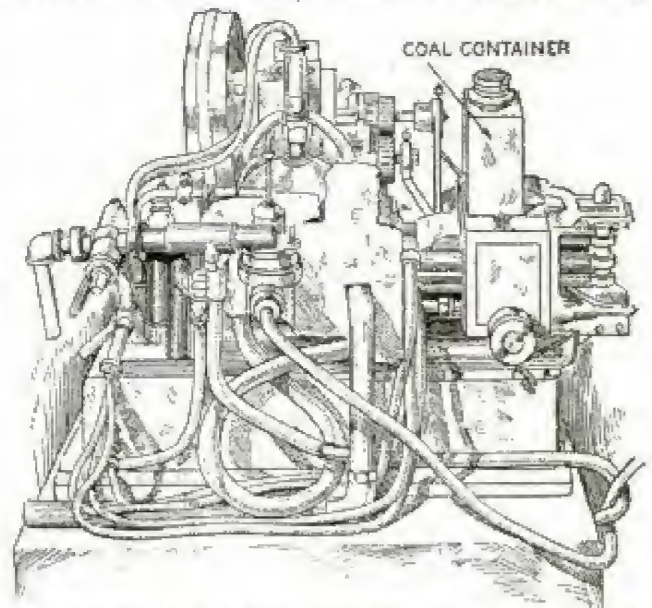
The automatic operation of the system depends upon the expansion by the heat of the fire of a curved laminated band of two metals of different expansibility, so arranged that when the temperature has reached a certain degree the band bends enough to cause an electric circuit to be closed, the alarm is sounded, and the gas generator started. The accidental starting of the generator through the breakage of a conductor is prevented by means of a special arrangement of electrical connections.

REMARKABLE GAS ENGINE USES COAL AS FUEL

Receiving the claims at first with incredulity, makers of gas engines are now greatly interested in a remarkably ingenious internal-combustion engine which works directly from ordinary coal, and is said to run well, although as yet it is only in an experimental stage.

A large percentage of the heat generated in the ordinary gas engine is wasted, but in this engine, it is used for changing the coal into gas, although there is no separate gas producer. Bituminous coal, broken up into small particles, is placed in the fuel box and fed into four pipes by means of a bevel-driven screw feeder. These pipes pass, first of all, through a box extending from the engine, in which they are heated by the exhaust gas, and then right through the combustion chamber, out again on the other side of the engine, and down into a water chamber. The coal is heated to incandescence inside the pipes, steam from the top of the water jacket is brought in contact with the coal, and air is also introduced into the mixture. The resultant gas is drawn off into the cylinder by the suction of the piston, fired by an electric spark, and exhausted in the ordinary way. The four pipes in which the particles of coal are gasified have their ends dipped in water, so that if any coal dust should pass beyond the point where the pipes bend downward, and

not be converted into gas, it will fall into the water, from which it may be removed when desired. The pipes by



This Remarkable Internal Combustion Engine, Invented by a Londoner, Takes Its Fuel Direct from Coal

which the gas is drawn from the hot coal also lead into this water chamber, but at a point above the water line. The gas then passes direct to the inlet valve of the engine through a pipe leading from the top of the chamber.

The engine has been run several hours at a time on a coal consumption of less than 0.4 lb. per horsepower-hour. In its present state it must be started up and run until warm on gasoline.

A NOVEL SCREWDRIVER

A screwdriver, the handle of which will never come off, except it gets in the way of a sledge hammer or the cutter of a shearing machine, is shown in the accompanying illustration. It is made of a single piece of steel and the handle is fluted so as to afford a natural and positive grip, and also to



An All-Steel Screwdriver

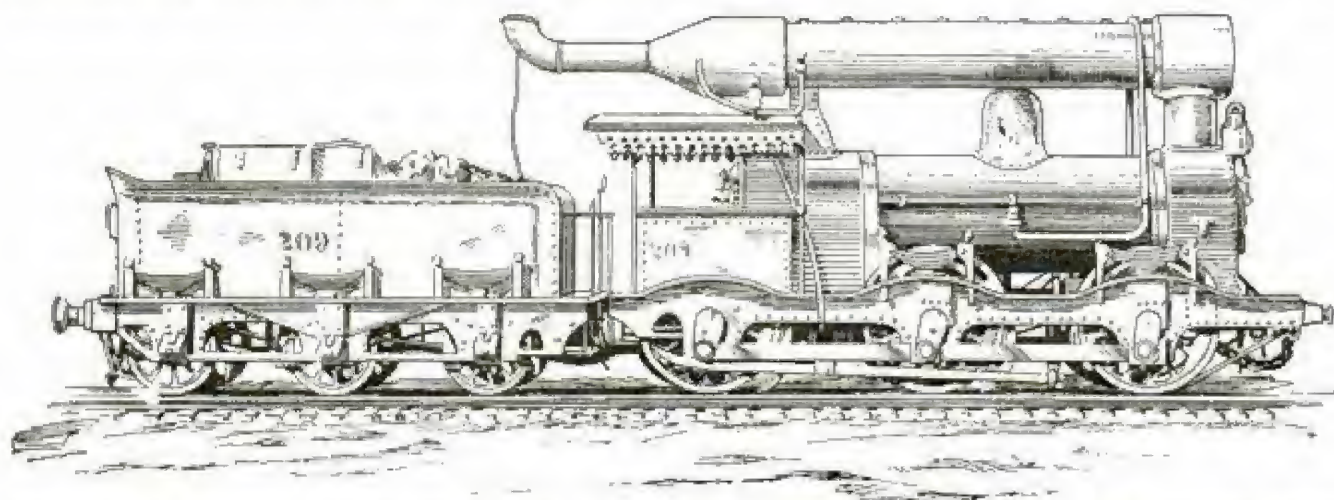
reduce the weight. The design is slightly modified in different sizes of the tool, but all of these are on the general lines of the screwdriver shown herewith.

"FREAK" LOCOMOTIVE BUILT IN EGYPT

This locomotive of remarkable appearance was the object of feed-water heating experiments carried out on the

the pyramid was forced open in 818 A. D., by the Caliph Mamoun.

The joinings of the casing stones, and those of the super-pavement on which they rest, are almost invisible, appearing in places like mere pin



Experimental Egyptian Locomotive Provided with a Long Horizontal Exhaust-Steam and Flue-Gas Heater

Egyptian State Railways. The curious pipe is a long horizontal combined exhaust-steam and flue-gas heater, carried at the smokebox end by a vertical length of cylindrical flue, and near the cab end by a saddle fixed to the boiler shell. A considerable proportion of the exhaust steam was condensed by this arrangement, but at the same time, dirty water was thrown out of the chimney mouth, which did much damage to goods loaded in the cars behind. Minor modifications failed to minimize this nuisance, so the idea in this form was abandoned.

THE FOUNDATION OF THE GREAT PYRAMID

The latest excavation work on the Great Pyramid of Cheops by Dow Covington, the American Egyptologist and explorer, has laid bare a course of casing stones at the base, and now, for the first time, it is possible, at a glance, to see the entire structural details.

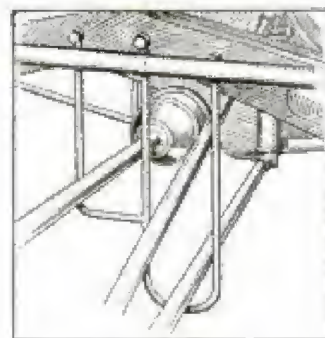
Nearly 20 casing stones and the pavement on which they rest have now been cleared. Four of the casing stones are perfectly preserved, owing to the debris which came down when

scratches, but every joint contains a web-like film of almost white cement.

The Great Pyramid of Cheops dates back to about 3700 B. C.

SAFETY LOOP FOR AUTO- MOBILE SHAFTING

The possibility of an accident which would cause the propeller shaft and radius rods of an automobile to become detached and fall to the ground while the car is running at a fast rate, has caused one company to provide a preventive. It is in the form of a light but strong safety loop, so contrived as to pass around the suspended members. Should the propeller shaft or radius rods become detached, this device would keep them from falling.



ⒸThe Navy Department plans to use balloons as targets for a part of the battle practice of the Atlantic Fleet during the maneuvers off the Virginia capes this spring.

THE GROOMING OF FLOWERS

The instruments used by the French florists to prolong the life of cut flowers and remove imperfections are as numerous and delicate as those on a well equipped dressing table. They include scissors of all sizes and shapes, small cutting pliers and pincers of many kinds, brushes, atomizers, sprays and bottles containing various gums.

A withered leaf or even one poorly developed ruins the appearance of a rosebud, consequently the one is cut off, and the other, if possible, is reshaped. The buds are also pierced as near the base of the flower as possible, with minute wires which keep the leaves in place. An instrument very similar to a curling iron is used to dress a faulty leaf.

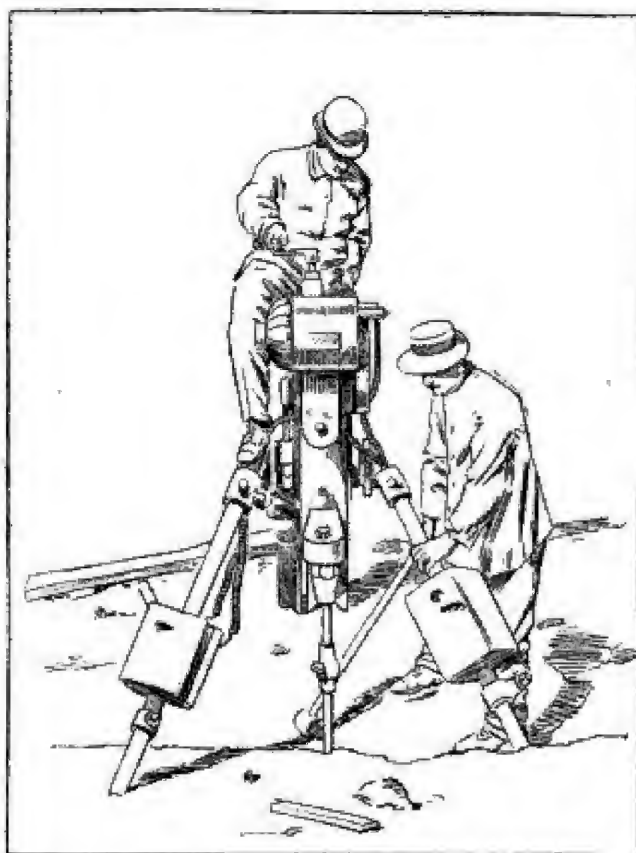
One of the means employed to prolong the life of the flower is to remove the anthers, so as to prevent the spreading of the pollen, for, if fertilization is allowed to take place, the flower has fulfilled its mission and soon fades. In flowers of the lily order, the anthers are removed for still another reason. They develop such an abundance of yellow pollen that it falls and taints the leaves, thus marring the spotless white beauty of the flower.

The stems of flowers that begin to hang their heads are placed in very hot water for about five minutes, and then are placed in a dark and cool place for about an hour.

ELECTRICALLY OPERATED ROCK DRILL

A new electric rock drill, claimed to combine the ruggedness of the air or steam drill with the efficiency, flexibility and economy of electrical power, utilizes compressed air as the medium transmitting the energy from the motor to the plunger. This air is not exhausted from the drill, but is retained to act continuously as a cushion between the piston of the plunger and the motor-driven reciprocating cylinder in which it operates.

The cylinder is connected to the motor through gearing and makes about 500 strokes per minute. Flexibly



A Compressed-Air Cushion Transmits Energy from Motor to Plunger in this Rock Drill

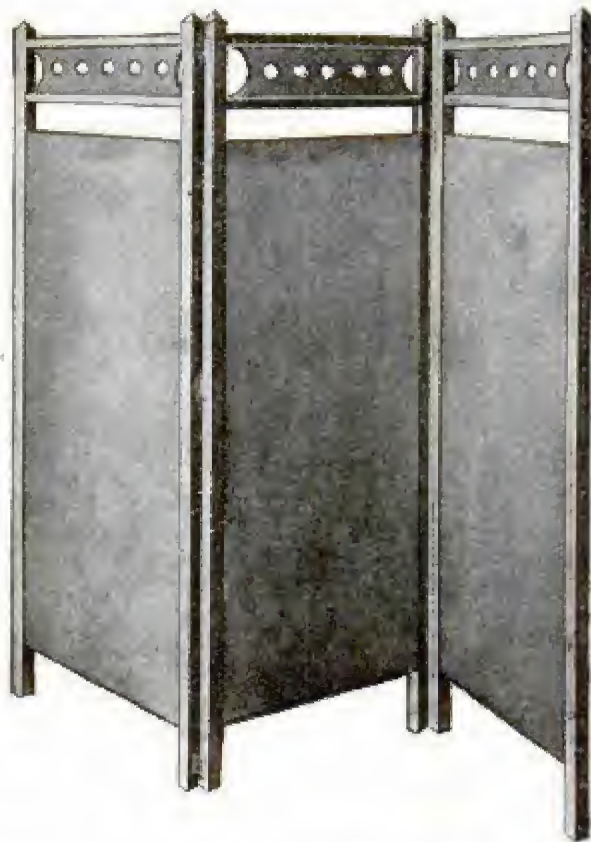
connected to this cylinder through the compressible air cushion at each end, is the head of the piston, which, of course, makes the same number of strokes per minute. The difference between this drill and the ordinary air drill is that the cylinder in which the air acts upon the piston is movable instead of stationary, and the compressed air is retained to protect the mechanism from shocks from the plunger, instead of being allowed to escape after having performed its work at the end of each stroke.

SUBSTITUTE FOR RADIUM

A cheap substitute for radium, said to be just as good for medical purposes, has been discovered. It is called mesothorium and is made from thorium, a heavy metallic iron-gray powder extracted from thorite, a mineral found principally in Norway.

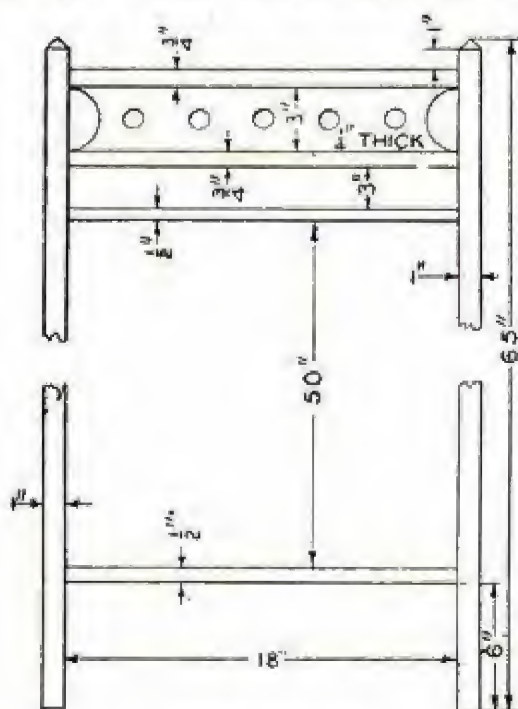
A MISSION SCREEN

In selecting or making up mission furniture for the home, a screen is necessary



An Easily Made Mission Screen

essary sometimes to add to the appearance of a room. The screen shown in



Details of Screen

the accompanying illustration consists of a few parts which are easily put to-

gether. The stock can be bought of any planing mill planed, sanded and cut to the proper lengths. The cloth, which should be of dark color, can be purchased at a dry goods store. The following list of material will be needed:

- 6 posts, 1 in. square by 65 in.
- 6 rails, $\frac{3}{4}$ in. square by 18 in.
- 6 rails, $\frac{1}{2}$ in. square by 18 in.
- 3 panels, $\frac{1}{4}$ by 3 by 18 in.
- 6 yd. of cloth.
- 4 double-acting hinges.
- 2 doz. $2\frac{1}{2}$ -in. slender screws.

Cut or plow a groove $\frac{1}{4}$ in. wide and $\frac{1}{4}$ in. deep in the center of one surface on each of the $\frac{3}{4}$ -in. rails. Cut out the ends with a compass saw. The five holes are bored with a 1-in. bit. The edges of these panels are inserted in the grooves of the $\frac{3}{4}$ -in. rails, using plenty of good glue.

When the glue has dried for at least 24 hours the screen frame can be put together. Holes for the screws should be bored through the posts where the $\frac{3}{4}$ -in. rails are joined and a screw turned into the end grain of each rail.

Scrape off all the surplus glue and sandpaper all the parts well. When this is done the finish can be applied. Any one of the mission stains can be used and finished with wax and polished.

The cloth is cut to length, a hem sewed on each end and one $\frac{1}{2}$ -in. rail put through each hem. Place the top rail in position and screw it fast. Stretch the cloth tight and fasten the lower $\frac{1}{2}$ -in. rail with screws at the bottom. Each section of the screen is finished in the same way.

The hinges are attached about 4 in. from each end of the posts in the same manner as in hanging a door.

SOFT SOAP WATERPROOFS
CONCRETE

The concrete foundation of a large grain elevator and flour warehouse on the bank of the river at Budapest, Hungary, on ground subject to high floods, has been thoroughly waterproofed by the use of soft soap. Instead of using

pure water in mixing the concrete and mortar for the 4-in. outer layer, a solution of soft soap was utilized, the proportion being about 8 lb. of soap per cubic yard of concrete and mortar.

Shortly after the completion of the work, the foundation was subjected to high water pressure and was found to be perfectly watertight, although a similar foundation near by, which had not been so waterproofed, allowed the water to seep through. The waterproofing action of the soft soap is not attributed to any water-repelling quality in soap, as in fat and mineral oils, but through the combining of the free lime of the cement with the potash in the soap, forming an insoluble compound which fills the pores.

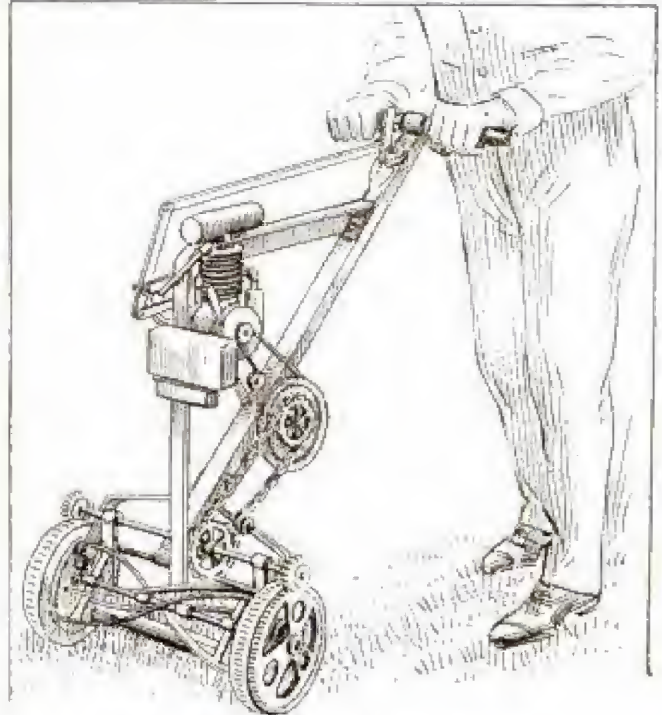
BOILER REPAIR BOLT

The domestic boilers used in connection with kitchen ranges or other sources of heat to provide hot water for household use are frequently discarded when a leak develops, because of the difficulty in repairing the weak places caused by interior corrosion. Such leaks cannot be soldered because of the expansion and contraction of the metallic surface when heated and cooled, but the leak may be effectively stopped by means of a special boiler repair bolt, the method of application of which is shown in the illustrations.

The hole through which the water is leaking is first reamed to the proper size and the twin bolts inserted as shown in the first illustration. Then the threaded sections are drawn together and a hard rubber washer placed over the bolt and against the outer shell of the boiler, followed by a steel washer and a cap, the latter being tightly screwed down upon the washers.

MOTOR-DRIVEN LAWN-MOWER

Many lawn-mowers of the large type, have for some time been equipped with gasoline engines as motive power, but

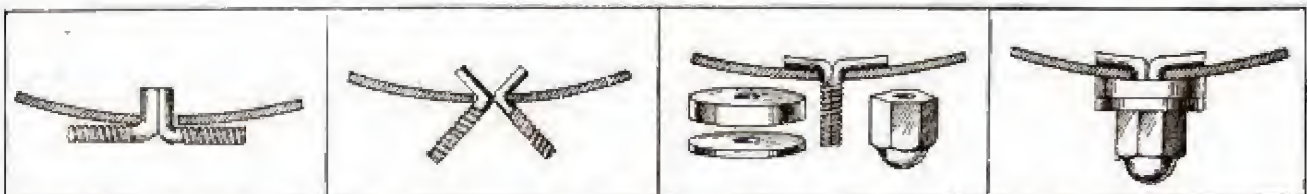


Small Motor-Driven Lawn-Mower

the accompanying illustration shows a gasoline engine-driven lawn-mower of the small type, ordinarily pushed over the lawn by the operator.

The actual mowing machine differs but little from the hand-pushed device, but attached to the handle is a framework bearing a small air-cooled engine, gasoline tank, ignition device, and the gears required for harnessing the power to the mower proper. The weight of the power plant is disposed on the frame in such manner as to be balanced in respect to the center of gravity of the mowing mechanism.

The operator walks behind the machine, grasping the handle in the same manner as if he really had to push it. All that is required of him is to keep it balanced and control the engine.



Inserting Twin Bolts in Hole

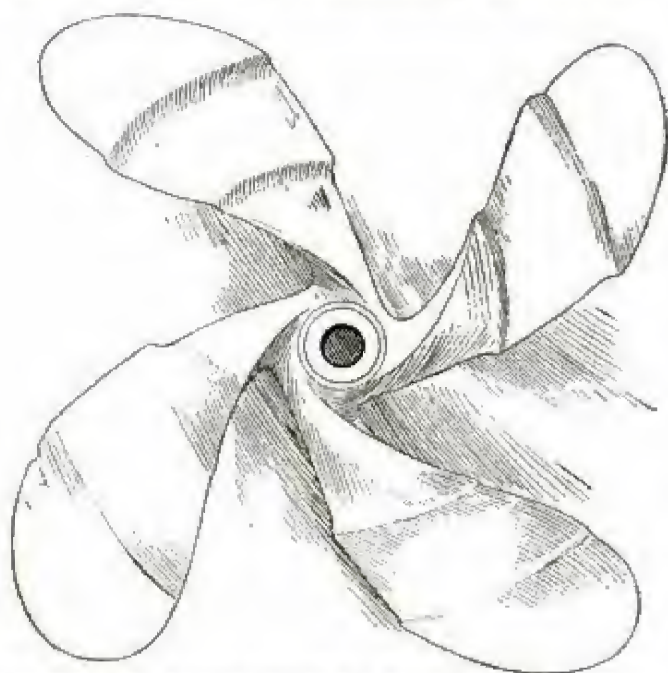
Turning the Bolts to Position

Ready for the Washers

The Completed Boiler Repair

CORRUGATED PROPELLERS

The corrugations on the driving side of this propeller effectually arrest the



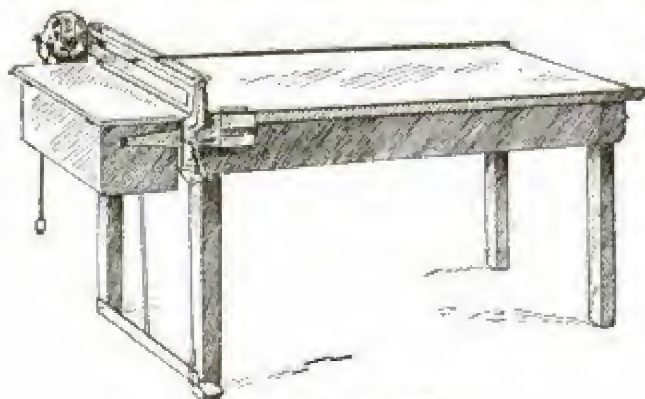
Corrugations Arrest Centrifugal Action of Water Along the Blade

centrifugal action of the water along the blade, thus preventing slip, and increasing the driving power of the machinery without increasing the revolutions or the consumption of coal. The corrugations are part of a true helix which enters the water without the slightest shock.

The corrugated propellers are made in sizes suitable for motorboats as well as for ocean steamships.

MOTOR-DRIVEN BLUEPRINT TRIMMER

A trimming table for blueprints and drawings, equipped with a motor-driven revolving knife which will cut a single



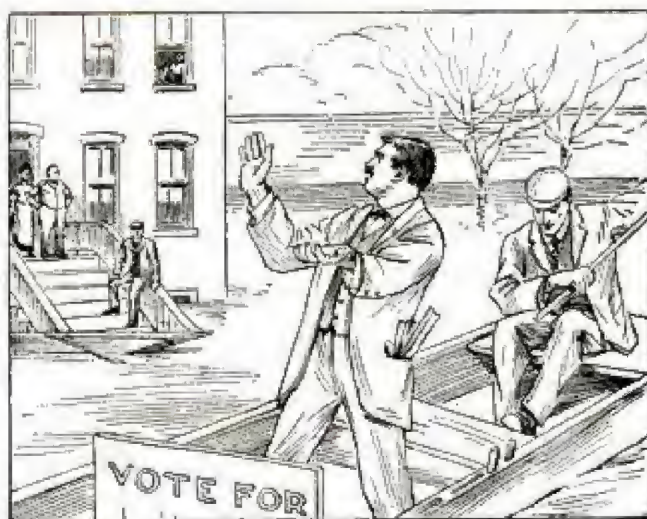
Motor-Driven Paper Cutter

sheet of the thinnest paper or as many as ten sheets at the same time, has been placed on the market by a Chicago firm. The top of the table is laid off in inches, and a sizing diagram gives, at a glance, the size and square foot measurement of any tracing or print.

The paper is held in position for cutting by a clamp operated by a foot treadle. The knife, which works in either direction, is started and stopped at any point by a specially designed wrist-controlled switch. This leaves the hands of the operator free for adjusting the paper.

VOTE CANVASSING IN BOATS

Although several sections of England were very much under water, owing to an unprecedented season of rain, during the weeks when the recent British election campaign was at white



Soliciting Votes in a Flooded District

heat, workers persisted in visiting every voter. In the North Huntingdon division the unionist candidate visited many of the voters' homes in a punt.

TO EXPLOIT THE MINERALS OF THE DEAD SEA

The Dead Sea basin, in Palestine, is likely to become a center of great activity. An important concession has just been granted by the Turkish government to an influential body of

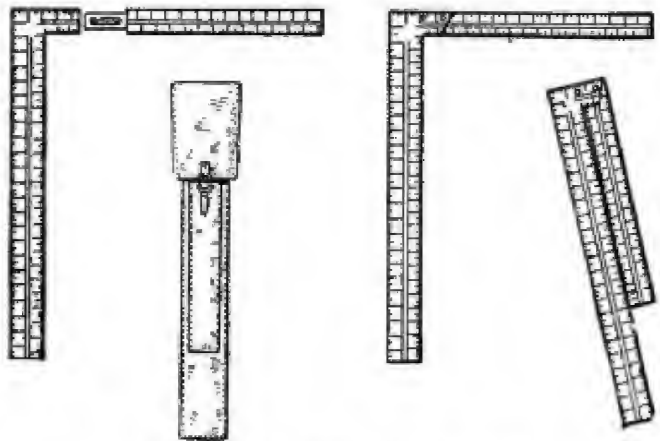
capitalists to exploit the minerals here, a sum of \$350,000 having, it is said, been paid for these rights. It is well known that the fine bitumen and also quantities of sulphur are obtainable here. Then, in Byzantine times, copper mines were worked near the south end of the Dead Sea, both in horizontal galleries and vertical shafts, while the basin is rich in marble, porphyry and other fine classes of stone as well as in phosphates. It often has been stated by American connoisseurs traveling to the Dead Sea that evidences of coal and oil that in America would be unmistakable, are very apparent in this region. Salt is also to be found in great quantities. In many ways this is the strangest body of water on the face of the globe. It is some 47 miles long and 10 miles wide at its greatest breadth, but its surface is no less than 1,300 ft. below sea level. The water contains 23 per cent of solid matter, and is, bulk for bulk, heavier than the human body. Indeed, it is impossible to sink in it, and it is so bitter and salt that fish cannot live in it.

PORTABLE SQUARES FOR CARPENTERS

Any carpenter will appreciate the convenience of folding his square when packing his tool chest to travel from place to place, as the rigid square in common use is an unhandy thing to carry around and is refused by express companies when it protrudes from the box. One of the tools shown was invented by a practical carpenter in California, who solved the problem by cutting a dovetail of 65 deg. and swinging on a solid steel rivet, butting against dovetail shoulders which lock by two hardened, tapered screws. The inventor claims that it serves the purpose of four tools, namely square miter, bevel and try-square, as it sets and locks at any angle. Enough of these folding squares have been in actual use to demonstrate their value to carpenters.

A second form of portable square is also shown. Here the square, instead

of being foldable, is made in two pieces which can be taken apart and packed

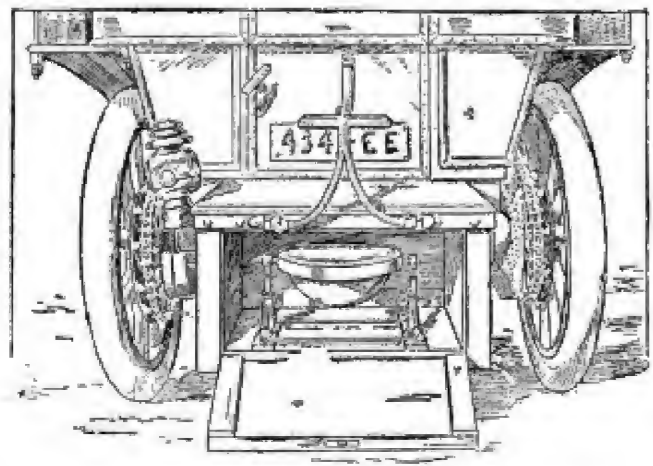


Two Forms of Portable Squares

in a neat little case as shown in the illustration.

POLICE AUTOMOBILE AS BOMB CARRIER

One of the police automobiles of Paris is provided with a specially designed box for the transportation of the bombs often discovered in anarchists' quarters. The box is fixed under the automobile body between the rear



Bomb-Carrying Automobile of the Paris Police

wheels, and contains a bowl, supported by a standard, in which the bombs are placed.

A hydraulic clutch for gasoline automobiles is a device being introduced by an English concern. It is said to enable a gasoline car to start with an ease rivaling that of the steam-driven car.

DRIP CUPS FOR BOTTLES

The soiling of table linen by the drip that runs down the sides of a bottle

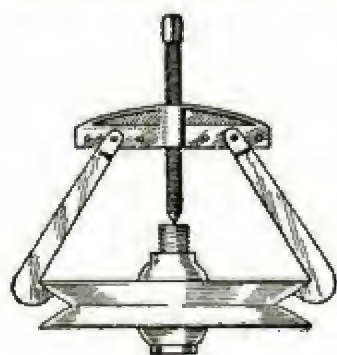


Protecting the Table Linen from Drip

after each using can be prevented by means of this drip cup. The cup, which is made of silver plate or nickel, is firmly held to the bottom of the bottle by means of spring clips. The shape of the receptacle is such that a bottle may be completely emptied of its contents without the cup spilling any of the drip it has caught.

A HANDY PULLEY REMOVER

Most motorists and mechanics have experienced, at some time or another,



a great difficulty in removing a pulley from its shaft or spindle. The handy device illustrated herewith is designed to fill a long-felt want in this connection.

It can be fitted with different-sized grips for pulleys of various diameters. The same tool may be used for removing cams and other parts, and is usually capable of

handling even the most obdurate of pieces by a few turns of the spanner and the application of a drop or two of oil.

ROLLING DAMS IN MEXICO

Great steel cylinders that are lifted and lowered by means of electric power, are being used to form water-storage reservoirs and to govern the flow for irrigation purposes in the Laguna district of Northern Mexico.

The rolling dams, as these cylindrical structures are called, are attracting much attention among irrigationists of this part of Mexico. They are an interesting and practical novelty, said to be specially valuable in controlling the water supply of the different canal systems. One of the benefits of this type of dam is that of permitting an uninterrupted flow of water through the streams in time of flood. This is done by lifting the cylinders above the flood water, and, when the current has subsided to a point where the danger of overflow is past, lowering them again and conserving the remainder of the flow.

These rolling dams in the Laguna district are of considerable magnitude. The first one to be constructed was on the San Marcos cotton plantation. It comprises two cylinders, each about 60 ft. long and 8 ft. in diameter, strengthened by interior bracing.

The installation of a rolling dam much larger than this is now being made in the great canal upon the plantation of the Sociedad del Tajo de la Traslquila in the Laguna district. This dam will cost approximately \$250,000. It will consist of two cylinders, each 90 ft. long and 12 ft. in diameter. The power equipment will be so arranged as to enable the lifting of these cylinders to a height of 25 ft. to get them out of the high waters when necessary. The electrically operated hoisting equipment is located above the masonry pier in the center of the river or canal, between the two cylinders. Each cylinder is controlled independently of the other.

A NOVEL WATER MOTOR

Floated on Kettle River, Washington, at a point where the stream is but 18 in. deep and flows at a speed of three miles an hour, the ingenious current motor shown herewith continuously pumps an astonishing quantity of water to a height of 20 ft.

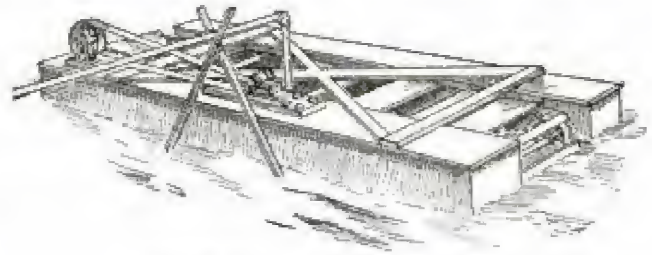
The motor is mounted between two floats, forming a catamaran which is anchored at both ends. The mechanism consists of two shafts mounted between the floats forward and aft. At each end and in the middle of the shafts are sprocket wheels over which run endless chains carrying a series



Side Diagram of the Motor

of current boards. These boards are provided with pintles to engage in guides paralleling the floats beneath the horizontal plane of the shafts, thus preventing the sagging of the chains. The boards work free upon their con-

nections with the chains and have their free edges stayed by chains attached



In Operation on Kettle River

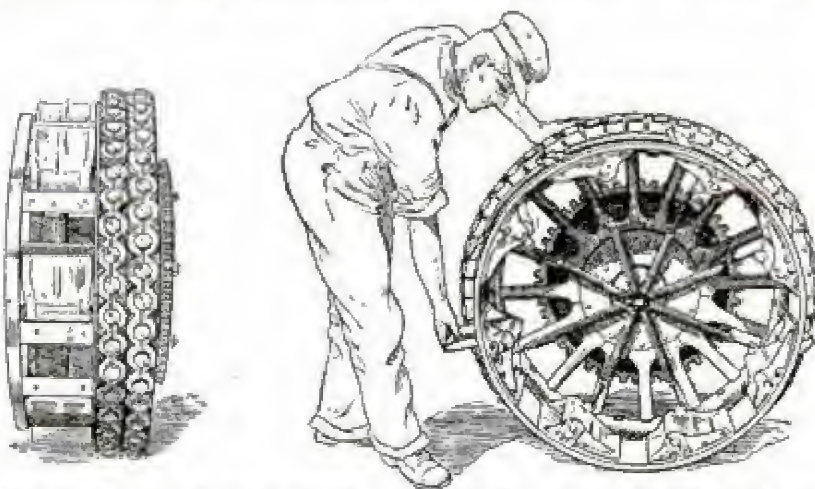
to the driving chains. These stay-chains hold the boards in a vertical position when they fall into contact with the current.

The motor is thrown out of operation by feathering the current boards by means of a lever, which throws bolts into the guides. The bolts catch the boards before they fall and hold them in a horizontal position. As the last board engaging the water passes out of the current, the motor stops. Mounted within one of the floats is a pump, belted by means of a pulley to one of the shafts.

EXTENSION RIM FOR AUTO WHEEL

A motor truck, claimed to be perfectly practical as a tractor in plowing and harrowing land as well as for haul-

The wheel rim is cast steel, perforated and filled with 2-in. round hardwood plugs, set diagonally across the face of the rim. The plugs give a good grip for traveling over soft plowed ground or muddy roads. The automatic extension rim is to provide an auxiliary bearing surface for the machine when traveling over very soft ground. Between wrought-iron bars are heavy lugs, 8 in. in width, mounted on pivots. When traveling over soft soil these lugs touch the ground, and the revolution of the wheel causes them



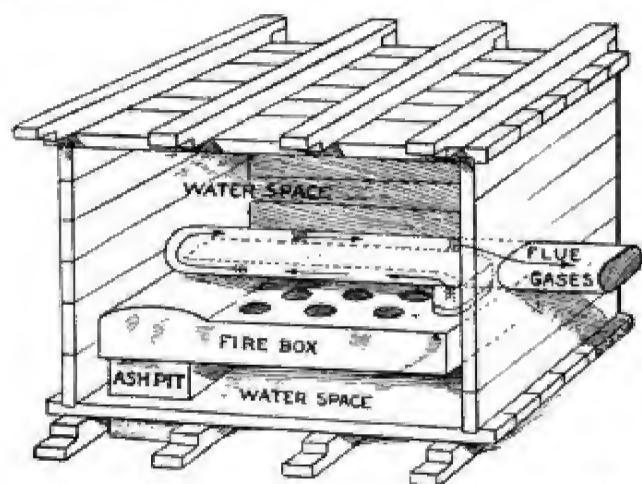
Wood Plug Tires and Expansion Bearing Surface on Wheel of Motor Farm Truck and Extension Rim with One of the Lugs Pulled Out

ing loads over ordinary roads, is equipped with front wheels having wood-plug tires and rear wheels provided with an automatic extension rim.

to be extended vertically, forming a solid bearing surface against which to push. They are drawn back by springs and go out of action when not needed.

WOODEN STEAM BOILERS

Steam boilers made of wood! It sounds incredible, and yet such boilers were formerly made and used. Even as recently as 1817, a steamboat plying between Norwich and New London,



Wooden Boiler Used in Philadelphia 100 Years Ago—Side Open to Show Inside Arrangement

Conn., was equipped with wooden boilers, and the reason that they burst under "extreme" pressure was attributed principally to the fact that they had no "condensers, safety valves, or balance wheels." From 1801 to 1804 there was a wooden boiler in service at the Center Square Water Works, Philadelphia. A partial view of this boiler is shown herewith. The ashpit, fire-box and flues were made of iron, but the inclosing box, in which the water was contained and the steam generated, was of wood. The steam pressure used was very little above that of the atmosphere, but the difficulty of preventing leaks even with this small pressure led to the early abandonment of wood as material for steam boilers.

OLD WALLPAPER A MENACE TO HEALTH

But five of the largest cities in the United States have ordinances preventing the affixing of wallpaper to the walls of any tenement houses unless all the old wallpaper shall have been first removed. Chicago, New York, Philadelphia, Baltimore and Louisville are the cities that boast the existence of such a municipal regulation. In

New York there is a state law to this effect which forms part of the so called "Tenement-House Act." The existence of the law or ordinance is due largely to the efforts of the sanitation experts who believe that disease germs are liable to find refuge behind the old paper. Fire department officials also endorse the ordinance because the removal of old paper will lessen the amount of inflammable material in a building.

LONG-DISTANCE FLIGHT IN FRANCE

The recent flight of Captain Belanger in a Bleriot monoplane from Paris to Pau is accounted a remarkable feat, considering that the temperature was below freezing and that no mishaps of any kind occurred. The flight from Paris to Bordeaux, a distance of 345 miles, was made in 5 hr. 21 min. of actual flight, with two descents, one of an hour and the other of about two hours. The fastest time ever made from Paris to Bordeaux was in an automobile race, the time being 5 hr. 13 min. The flight from Bordeaux to Pau, a distance of 112 miles, was made in 1 hr. 53 min., thus making a flight of 457 miles in 7 hr. 14 min. of actual flying time, which is an average speed of a little over 63 miles an hour.

NEW UMBRELLA SHAPE

Owing to the peculiar construction of this new umbrella, with its flatter



New Umbrella Shape Compared with Old

top and greater circumference, it offers much more protection and comfort

than is usually found in umbrellas of customary shape. It has three more ribs than the umbrella which is shown beside it for comparison.

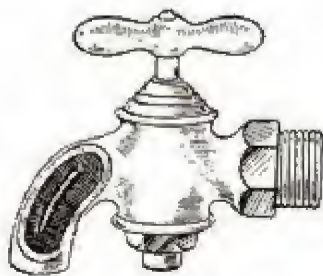
GREAT IRRIGATION PROJECT IN NEW SOUTH WALES

A great masonry dam for irrigation storage, similar in design and dimensions to the Roosevelt dam in this country, is being constructed on the Murrumbidgee River in New South Wales, Australia. The maximum depth of water behind the dam will be 224 ft. When the dam is full, the main river will be backed up for 40 miles, and two important tributaries to a distance of 24 and 19 miles. The capacity of the reservoir thus formed will be 33,380,000,000 cu. ft.

The estimated cost of the dam is \$3,680,000.

ANTI-SPLASH FAUCET

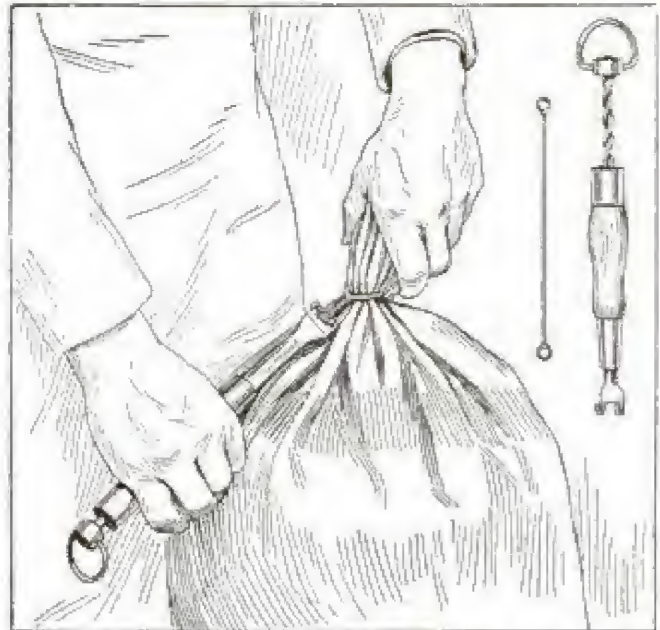
A faucet that will emit a stream of water which will spread instead of splashing against an object is one that will be appreciated by the careful housewife. The faucet shown here-with controls the flow of the water and prevents splattering by means of two small curved ribs cast inside of the spout. This construction has the merit of providing no place for the lodgment of sediment, as is the case with the gauze-wire devices sometimes used in faucets to prevent splash.



BAG-TYING TOOL

The operation of closing bags with a wire tie by means of a specially constructed tool is shown in the accompanying illustrations. The wire tie is looped at both ends, and, when passed around the neck of the bag, these loops are placed over the two hooks at the

end of the tool. The sliding handle is then pulled, this action revolving the



The Wire Tie, After Being Passed Around the Bag and the Loops Placed Over the Hooks, is Twisted by Pulling Out the Sliding Handle

central rod bearing the hooks and twisting the ends of the wire together. Due to the formation of the loops at the end of the wire, which are left separated when the tying is completed, the latter is easily untwisted when the bag is to be opened.

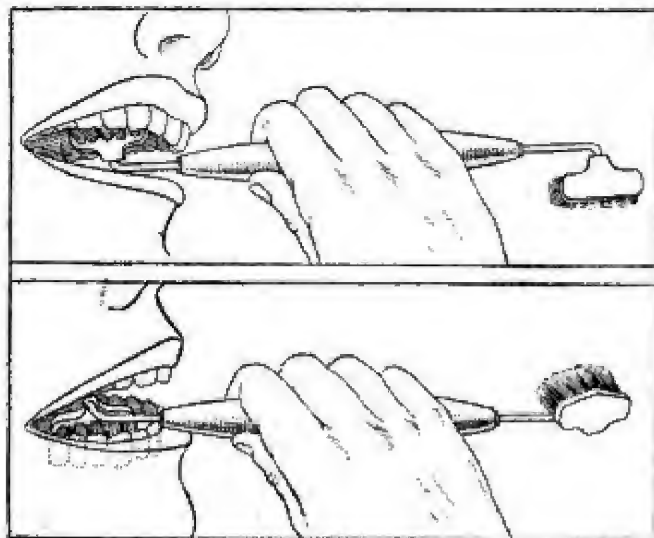
TWELVE MILES OF CONCRETE PIPE

Twelve miles of 36-in. concrete pipe have been constructed down a canyon on the east slope of the Rocky Mountains, in Colorado, to convey water to the hydroelectric power plant of the Eastern Colorado Power Co. The line extends from a concrete masonry dam across a stream 8,000 ft. above sea level to the power house near Boulder, the grade having a fall of approximately 26 ft. to the mile.

The construction of this pipe line was unusually difficult, a large percentage of the excavation being through solid rock. Rocky hills, jutting out here and there into the canyon in such manner as to make the cutting of a trench impracticable, had to be tunneled. Seven tunnels, having a total length of 1,500 ft., had to be pierced through this rock.

NEW TOOTH BRUSH CLEANS INNER SURFACE

A double-ended tooth brush designed especially for cleaning the inner sur-



A Brush to Clean Inner Surfaces of the Teeth

face of the teeth is shown in the accompanying illustrations. It was invented by a dentist of Memphis, Tenn., and its shape enables the user to brush the teeth with a rotary motion. The brush on one end is designed to operate on the right side of the lower jaw and on the left side of the upper, the brush on the other end being modeled for the lower left side and the upper right jaw.

THE DWARF GARDENS OF JAPAN

The diminutive size of things Japanese, and especially of the dwarfed trees and gardens, is partly due, according to a Japanese magazine, to the limitations of the land itself. This necessitates the utilization of every foot available for cultivation for the maintenance of the millions of Japanese, and even in towns and villages, the houses are grouped together and seemingly confined to small dimensions for the purpose of yielding to the plow the space they might occupy.

A great affection is therefore felt for the dwarfed tree or plant, the Japanese as a people being lovers, some-

times almost worshipers, of nature. The poorest and meanest habitation in the most densely populated parts of the large cities, without space enough, it would seem, for even the smallest building, will often have a portion of this space, if only 6 ft. square, devoted to a tiny garden, where things are necessarily in miniature.

An available garden space of like size in America would be given over to one lilac bush or a group of sunflowers, and could not be compared in any way with the gardens of more fortunate beings, who have large ground space. Such utilization of a 6-ft. space does not appeal to the Japanese. The garden, though tiny, must have many trees and plants, and usually a lake or brook. Consequently everything must be in miniature. But the dwarfed trees and plants are not confined to such gardens. In the spacious gardens of the Japanese rich they are usually chosen in preference to full-sized trees, as being unique and artistic.

There are two general classes of dwarfed trees and plants, one being the natural, and the other the fantastic. In the former, the exact character of the full-sized tree is preserved, root, trunk and branch, the height not exceeding 2 or 3 ft., and sometimes much under that. The fantastic or conventional class includes umbrella, fan, boat, dragon shapes, etc., and also imitations of the growth of other trees, such as training plum branches to droop like those of the willow, or making a pine grow like a banyan.

BELT-DRIVEN AUTOMOBILES

A belt-driven automobile is being marketed by an English concern of some repute. Changes of speed are effected by pushing the belt from one pair of pulleys to another up or down conical parts which connect the pulleys of different diameters. One merit of this method of speed control is that a change of speed can be made without any sudden jarring.

The Kingdom of Dust

By J. Gordon Ogden, Ph. D.

THIS is the third of a series of articles by Dr. Ogden, who is professor of physics at the Fifth Avenue High School, Pittsburg, Pa. In every home, in every office, in every shop or factory, the fight against Dust is never-ending. Dr. Ogden illuminates this subject in a manner which brings a realization of its infinite importance.

III—Cosmic Dust

FEW of the inhabitants of this old world of ours realize that we are constantly being bombarded from the heavens above and below us. Every 24 hours from ten million to fifteen million shots are fired, each of the projectiles having a velocity far greater than that of a rifle bullet; and this does not include the myriads of projectiles too small to be seen by the naked eye. Luckily for us, we are protected by a sheathing of atmosphere, that is quite effective against these swiftly moving messengers from outer space. Occasionally a mass weighing anywhere from a pound up to a ton or more, slips through, but, for the most part, these projectiles are tiny particles of dust and gas, and their only effect is to produce a brilliant streak of light known to us as a "shooting star." A "shooting star"

is in no sense a star. Were a real star to strike our earth, this planet would vaporize almost instantaneously and all that would be left of us would be an incandescent mass of gas and vapor, just as we once were, billions of years ago.

When a "shooting star" strikes our atmosphere, its energy of motion is transformed into heat, from the friction produced by the air, and the "star" is literally burnt to ashes. These ashes fall upon us in a continual shower, and constitute the greater part of what is commonly known as cosmic dust. Nordenskjöld, the Swedish naturalist, by melting several tons of snow in far-off Spitzbergen, found distinct globules of iron in the sediment thus obtained. By the use of a specially constructed dredge, ooze from the bottom of the



Meteorite Pitted by Great Heat Due to Friction with Earth's Atmosphere—Fell from the Sky at Canon Diablo, Colo.



Peculiar Markings on Section of Meteoric Iron, Supposed to Be Messages from Inhabitants of Other Worlds

deepest part of the ocean has been brought up, and part of it is undoubtedly cosmic dust.

It is an extremely difficult matter to determine the chemical composition of these cosmic visitors, but in a few instances, observers have been fortunate enough to analyze their light by means of the spectroscope, and have determined the probable presence of sodium and magnesium. Although the earth is continually receiving additions to its mass in the form of finely divided dust, it would take a long time to gather enough to make any appreciable difference in its weight or its velocity. It has been calculated that it would take at least a thousand million years to accumulate enough dust of this character to make a layer an inch thick all over the surface of the earth. And yet, insignificant as is this small daily accretion of cosmic matter from meteors and shooting stars, it is bound, in time, to bring about important and seemingly wonderful changes in this old globe of ours. For example, this added weight will gradually shorten the year by adding to the mass of the earth, thus increasing the attraction between the earth and the sun; it will diminish the size of the orbit of the earth, adding to its velocity, and will increase the length of the day by increasing the earth's diameter.

However, it is quite unnecessary for us to worry about any possible changes in the calendar, or to take into account the increased length of day, as from all these sources it will take over a million years to make a change of one second in the length of our year.

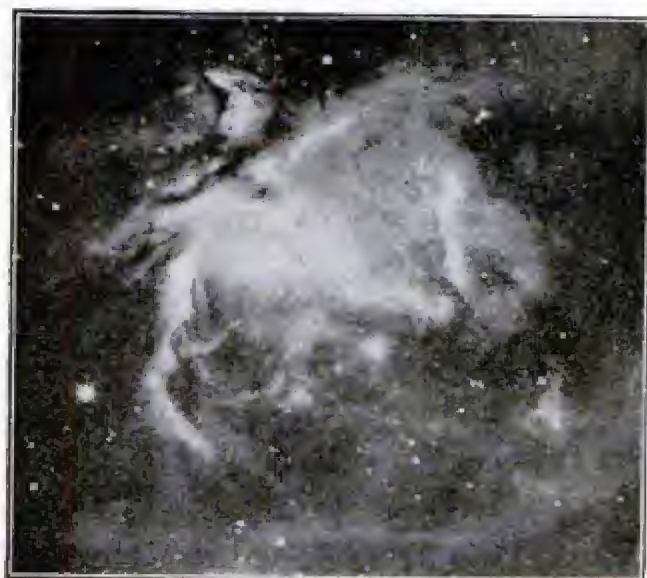
The meteors which flash through the air and fall upon the earth as meteorites are objects of wonderful interest. How delightfully vague is their origin! What untold billions of miles have they traveled! What wonderful tales could they tell were they able to talk to us about their age-long wanderings! Possibly they were thrown out from our own sun, as no elements have been found in them which are not present in the chief of our solar system. At one time it was suggested that possibly

these strange wanderers from out the infinite night might be messengers projected to us from the inhabitants of other worlds than ours.

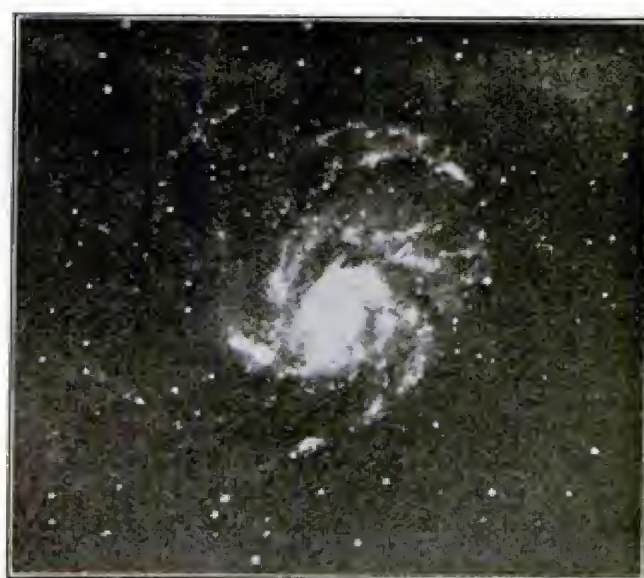
A German scientist, Widmanstatten, made a curious discovery relative to meteorites, which at first glance seemed to bear out the dream of those who believed that possibly some meteorites might be messengers from sentient beings somewhere in the vast empyrean. When meteoric irons are etched by a powerful acid, strange figures and designs appear upon the surface. Immediately, the fanciful seized upon these Widmanstatten figures as absolute evidence of an effort on the part of the inhabitants of other worlds to communicate with us.

In 1880, an attempt was made by Dr. Hahn, of Tübingen, to prove the presence of animal life such as crinoids and corals in a certain meteorite, and he also claimed that the Widmanstatten figures are the result of plant life. Scientists generally regard this memoir of Hahn's as an elaborate jest. Widmanstatten figures, as shown in one of the illustrations, are probably due to crystallization resulting from the intense heat to which the meteorite was subjected in its passage through the atmosphere. In other words, the meteorites, siderolites and aerolites that have come to us from afar have not furnished us with a scintilla of evidence of life beyond our earth. It is true that some of the visitors from outer space show the presence of carbon to a marked degree. While carbon is a strong presumptive evidence of life, since it is by plants that carbon is elaborated from gaseous compounds, it has been pointed out that the carbon in meteorites may have been derived from the atmosphere by absorption. Professor Maskelyne has shown in this connection that all carbon compounds in a meteorite may be completely removed without pulverization of the stone, thus bearing out the theory that the carbon was only in the pores of the meteorite, and not an original constituent.

A curious fact concerning the extremes of temperatures to which me-



"Outposts of the Kingdom of Dust"—The Great Nebula in Orion



Spiral Nebula, Billions of Miles in Extent, in the "Great Bear"

eteorites have been subjected may not be uninteresting. A meteorite moving through space beyond the atmosphere receives heat only from the sun and stars, and as the temperature of space is very low, probably near to the absolute zero of temperature, 459 deg. below Fahrenheit zero, these wanderers in space are extremely cold. And yet when they fall upon the earth their outer crust of iron is curiously pitted from the intense heat produced by the friction of the atmosphere. These pittings are undoubtedly due to partial melting. As iron melts at 2800 deg. Fahrenheit, a meteorite passes in a short interval through a range of nearly 3000 deg. Fahrenheit.

The interior of a large meteorite is intensely cold for a considerable time after its fall. One which fell in India in 1860, embedded itself in moist earth, and was found half an hour after its fall coated with solid ice. After a meteor has passed through the atmosphere, very often a train of luminous dust is left which glows sometimes for an hour. Physicists have speculated as to the cause of this luminescence, as it could not possibly be from heat. A similar phenomenon has been observed when certain substances are cooled below the temperature of liquid air. Whatever may be the cause, it is certainly a case of light without heat.

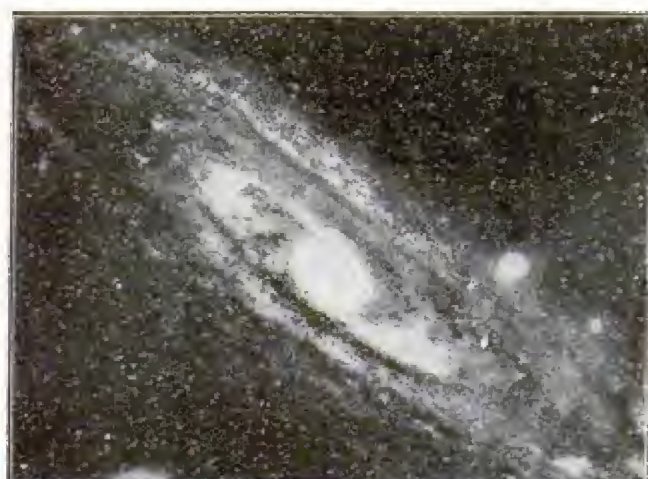
On a clear starlit night, anyone

possessed of good eyesight may see a faint, hazelike cloud of glowing splendor in the girdle of the constellation Andromeda. If Orion is above the horizon, the same phenomenon may be observed in this well-known group of stars. These shining cloudlike forms, far-flung throughout the starry depths, a billion times more delicate than the filmiest lace ever wrought by the hand of woman, are known as nebulae. It was formerly thought that they were stars so remote that no telescope could ever resolve them. It is now known that they are not stars, but are probably made up of extremely rarefied hydrogen, and other gases, containing small particles of solid matter—outposts of the Kingdom of Dust. These nebulae are of different forms, some being lens-shape, others resemble a dumb-bell, while many occupy billions of miles in the form of great winding spirals.

From a study of these nebulae, Laplace, Kant, and Swedenborg evolved the famous nebular hypothesis, a wonderful and stupendous conception, which seeks to account for the origin of such aggregations as our own solar system. Briefly stated, the nebular hypothesis is simply this: that our sun, for example, was once a nebula extending far beyond the present orbit of the uttermost planet Neptune; that a revolving, whirling motion was set up in this nebula, and that the different planet



"Stars Whose Light We Could Not See Through 15 Miles of Ordinary Air at Sea Level, May Readily Be Seen Through Ten Million Miles of a Comet's Tail"—Daniel's Comet, August, 1907



"A Billion Times More Delicate Than the Finest Lace Ever Wrought by the Hand of Woman"—The Great Nebula in Andromeda, One of the Northern Constellations

masses were set free from the parent mass; that these planet masses in their turn disengaged still smaller masses, which formed the various moons of the solar system; that the sun is all that is left of the original mass of our primal nebula.

There are quite a number of objections to the nebular hypothesis, one being the failure to account for the peculiar distribution of the larger and smaller planets. Professors Moulton and Chamberlain have formulated a very clever and reasonable modification of the nebular theory, known as the planetesimal hypothesis. This hypothesis does away with a number of the inconsistencies of the original theory of Laplace, and is quite favorably regarded by scientists.

Another theory is known as the meteoric hypothesis, or "capture" theory, so strongly advocated by Professor See. This theory claims that the larger masses in the universe attract to themselves the smaller bodies. But, though we know not which theory is nearest to the truth, the fact remains that small particles of matter—world dust in fact—form the primordial stuff of the universe, and that in all probability all the heavenly bodies from the giant suns like Sirius, down to the smallest particle of cosmic dust that constitutes a shooting star, originated in dust—dust so fine, that stars of small magnitude may readily be seen through it.

It is quite probable that cosmic dust,

although it is so fine and so rare, has an important effect in the fact that it obscures to a greater or less extent the light of the more distant stars. We see through a veil of dust, and it is quite likely that the stars whose distance has not been determined are not nearly so far away as they appear.

Arrhenius has estimated that if there are upward of a hundred of particles of cosmic dust to every cubic mile of space, evenly distributed, they would be sufficient to block from our view the most distant stars, and to render the light of those that are nearer much fainter.

Closely allied to meteorites and nebulae are those wonderful and spectacular members of the celestial family known as comets. Sweeping through the heavens with frightful velocity, and occupying such vast areas with their shining tails, it is no wonder that they have been objects of superstitious dread in all ages and climes. There are known to us about 450 of these mysterious cosmic tramps, and all are members of the solar system. Between 35 and 40 of these are termed periodic comets, as their orbits have been calculated and their return may be prophesied with certainty. The others are the waifs and strays of our solar system, and some of them have immensely long periods. The comet of 1811, for example, will not make us a return visit until the year of our Lord 4876.

What is a comet? Simply a mass of

shining dust and gas, with possibly some larger particles of matter as a nucleus or head. As regards a comet's weight, no one has been able to estimate it, for the reason that no comet has as yet been observed to have the slightest pull on any of the planets. Some astronomers claim that an ordinary comet could be crowded into an ordinary hat box, and would weigh only a few pounds, while others claim that millions of tons would be nearer the truth. The matter in a comet is distributed over such tremendous area that its average density is less than the vacuum of an ordinary incandescent electric bulb. That a comet is made up of highly rarefied matter is shown by the fact that

stars, whose light we could not see through 15 miles of ordinary air at sea level, may readily be seen through ten million miles of a comet's tail.

It is quite probable that at certain times our own earth has a cometary tail, extending five or six hundred miles into space. The wonderful Aurora Borealis and the Aurora Australis are supposed to be electrically illuminated particles of gas and dust similar to those observed in the tails of great comets. The earth's comparatively enormous mass prevents the escape of any noteworthy portion of our gaseous envelope, and hence we are unable to rival the smaller bodies in the length of their appendages.

SUCCESSFUL GRAFTING OF COLD-STORAGE SKIN

A piece of skin that had been removed from an injured man in the Samaritan hospital, Philadelphia, and placed in a cold storage room, was taken out of storage five days later and grafted upon the injured arm of a woman patient. The success of this operation shows the possibilities of cold storage in surgery as a preservative of animal matter which is not at the moment required but may prove of value later.

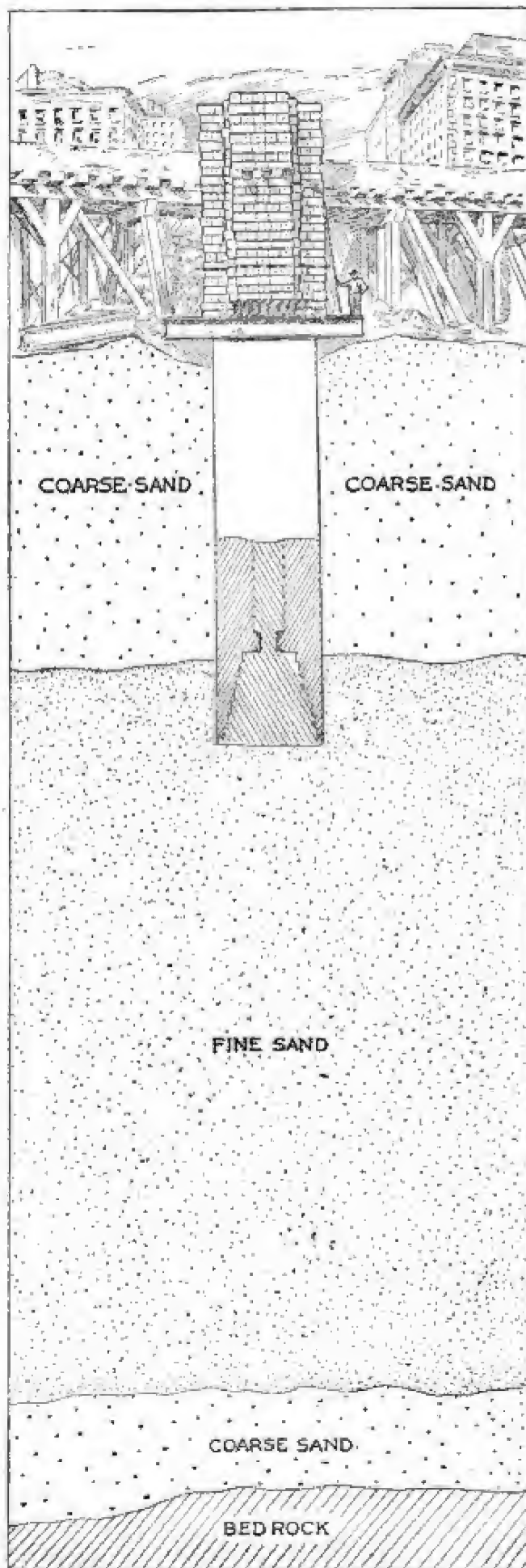
PREHISTORIC ANIMALS IN CEMENT

In striking contrast to the live animals, and furnishing a remarkable object lesson to the student of natural history and evolution, the collection of life-sized cement models of prehistoric reptiles and mammals now nearing completion in the grounds of Carl Hagenbeck's animal park at Hamburg, enable one to review in comprehensive fashion the animal life of millions of years ago. From the best authorities and the finest museums of natural history have been gathered the data to make this seeming fairyland as perfect and trustworthy as possible.



Cement Model of Stegosaurus in Hagenbeck's
Animal Park

Among the specimens represented are the 66½-ft. diplodocus, a herbivorous dinosaur with a long neck and tail and diminutive head; the stegosaurus, another of the dinosaur family, having great bony ridges down its back; the triceratops, a 25-ft. monster with a 7-ft. head having two large horns projecting from above the eyes, a horn on the nose, and a great bony hood over the neck; and the giant sloths, mammoths and flying reptiles with enormous teeth and terrible claws, all now as extinct as the dodo.



One of the Greatest Tests in the History of Engineering.
A Sand-Supported Pier Sinks Less Than One Inch
Under Direct Load of 908 Tons

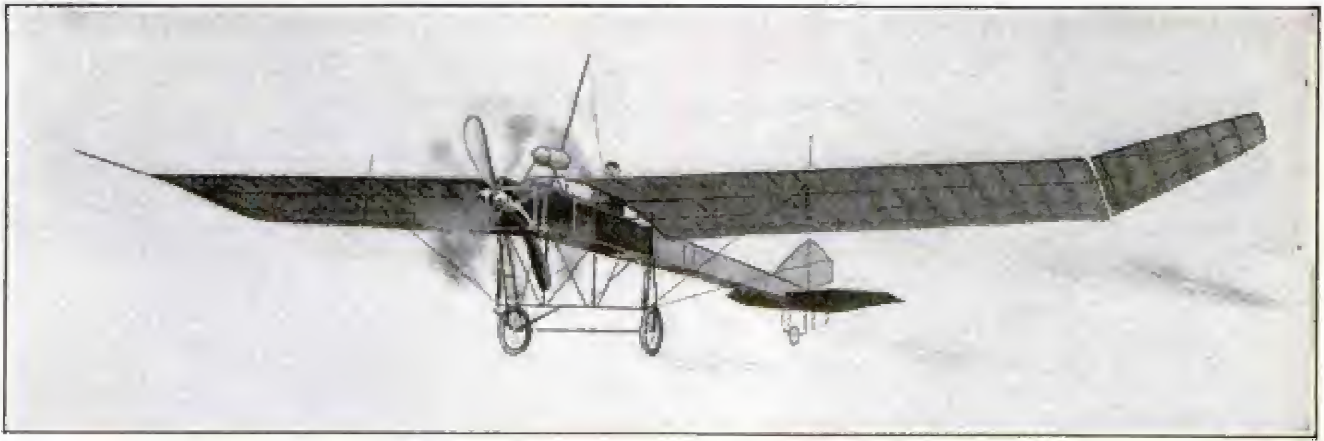
INSURING THE SAFETY OF A 40-STORY SKYSCRAPER

Loaded with a dead weight sufficient to crush a solid cast-iron column $8\frac{3}{4}$ in. in diameter, one of the 106 concrete piers that will support a 40-story skyscraper in New York City settled less than an inch, although resting on a sand foundation. This remarkable test entirely demonstrated the safety of building part of the immense structure on sand, for the test load of 908 tons on the concrete pier exceeded by 66 per cent the maximum load that will ever be put on this particular support, even under the most extreme conditions of wind pressure, and the pier used for the test was purposely chosen as being the weakest link in the chain of piers comprising the foundations of the building.

This 40-story structure, the latest of New York's mammoth skyscrapers, is the municipal building being erected at the Manhattan terminus of the Brooklyn Bridge. The engineers have calculated that a total vertical load of 165,000 tons will have to be supported by the foundations under the most extreme conditions of loading and wind pressure, a force that would absolutely crush a solid cast-iron column of about 10 ft. diameter.

Owing to the fact that a quicksand underlies the site of the building, some extraordinary engineering problems had to be solved in its construction, and these were rendered still more difficult inasmuch as only 68 of the 106 concrete piers could be sunk by the pneumatic caisson process to reach the solid rock. The others had to bear on sand, and this was the reason for making a direct bearing test on the most unfavorably situated of the remaining 38 piers, to make sure that they would support and transmit through the sand to the underlying rock the load of 6 tons per square foot they have to bear. The rock-supported piers carry 15 tons per square foot.

The test was extended over a period of 24 days, the load being added gradually for 17 days and left in position for



A French Aeroplane without Horizontal Rudder

a week before being removed. The pier tested is 10 ft. 9 in. in diameter and 34 ft. 5 in. deep. A grillage of two tiers of 24-in. I-beams was laid over a bed of 3-in. plank placed on top of the pier, so as to form a cross measuring 15 ft. by 20 ft. in extreme dimensions. On this were placed the loading blocks of cast-iron, weighing about 3,500 lb. each.

NEW MONOPLANE HAS NO HORIZONTAL RUDDER

The new Lefevre monoplane, which has recently undergone its first trials and shown remarkable stability, is a radical departure in aeroplane construction, in that horizontal rudders usually affixed in front of or behind the supporting planes are entirely done away with. The vertical steering is accomplished by changing the angle of incidence of the main planes, the operation being accomplished in a manner similar to that of turning the front wheels of an automobile.

One noteworthy improvement in this machine is that, no matter what inclination it is given by the operator, the angle formed by the tail planes and main wings always has its apex downward, thus maintaining the longitudinal stability at all times. In descending, the curve described by the aeroplane tends to flatten instead of becoming more abrupt, the latter being a frequent cause of fatal accident.

The lateral stability is not obtained by warping the wings, but by means of the "ailerons," which are the hinged

ends of the main supporting wings. The weight of the machine, with the operator, fuel and oil, is 1,100 lb.

FULFILLING CONDITION OF ANCIENT BEQUEST

By an ancient bequest of Thomas Glanville, whose body rests in the graveyard of the quaint old parish church of Wooden Hatch, near Dorking, Eng., seven boys are awarded \$10 each every year, if they can successfully recite the Lord's Prayer, the Ten Commandments and the Apostles' Creed while standing with their hands on the tomb.



Seven Boys Reciting Lord's Prayer, Ten Commandments and the Apostles' Creed to Secure \$10 a Year

HOPPING FOR HUSBANDS

This huge pillar, bearing an iron man on its top, is associated with a curious



Tradition Has It That Any Unmarried Woman Who Hops Around This Pillar Thrice Will Get Husband within the Year

superstition that any unmarried woman succeeding in hopping around it three times will get a husband within the year, and many visitors test the value of the legend. The pillar is a few miles out of Waterford, Ireland, and was erected to enable vessels to distinguish between Tramore Bay and Waterford Harbor.

A GIGANTIC LIGHT BUOY

At the mouth of the river Gironde, about 60 miles from Bordeaux, France, will be placed what is said to be the largest light buoy in the world. Its cylindrical main body has a diameter of 3.1 meters (10.7 ft.) and is 6.5 meters (21.32 ft.) high with a capacity of 45 cubic meters (about 1,600 cu. ft.). Be-

sides being the float, the body also serves as a reservoir for the illuminating gas, which is confined under 85 lb. pressure. The anchoring chains are attached to a bridle, pivoted at the middle of this cylinder, which is weighted with 26 tons of ballast to prevent capsizing. The mast has a diameter of 0.98 meter (3 $\frac{1}{4}$ ft.), is 6 meters (19.7 ft.) high, and supports at its upper end a platform on which the lighting apparatus is installed. This is reached through an outside iron ladder and a trapdoor.

ALLIGATOR FURNITURE

One of the oddest sets of furniture in the world is made from the hides, heads and feet of alligators. The upholstered chair is covered with the beautiful checkered skin and two young alligators apparently climbing up the back of the chair meet face to face at the top. The legs are covered with skin from the tail, which has a ridge of hard protuberances, and these have a decorative effect which is quite unique. The table is even more striking, as it has four natural looking alligator heads, one grinning from each corner. A footstool of the same unusual material completes the set, which is owned by a man in Los Angeles, who raises the big saurians for the market. It is valued at \$500 and is said to have required the hides of 16 of his pets.



Chair and Table Finished with Alligator Hide



The Skeleton of a Locomotive in the Foreground Was Driven from a Position between the Other Locomotives by an Explosion That Killed Nine Men

A TERRIFIC LOCOMOTIVE EXPLOSION

One of the most terrific locomotive explosions ever recorded occurred recently on the turntable in the yards of the Missouri, Kansas & Texas Railroad at Smithville, Texas, instantly killing nine men and injuring 11.

The locomotive had just come from the shop, where it had practically been rebuilt, and was standing on the turntable among other locomotives. It is believed that the explosion was due to the fact that the pipe leading to the steam gauge was corroded and clogged up. The gauge only recorded 145 lb. of steam, while the actual head is believed to have been between 600 and 800 lb. The safety valve, which was being adjusted by a machinist when the explosion occurred, was screwed down as far as it would go.

The force of the explosion was tremendous. The machinist was torn to

pieces, part of the body being blown over the roundhouse and falling 600 ft. distant. Three legs were picked up with this body, while another body, with neither arms nor legs, was blown

700 ft. in another direction, falling in the yard of a residence. The locomotive was skidded over the ground a distance of 75 ft., in the condition shown in one of the illustrations, and the tender was blown back into the pit of the turntable. A piece of the fire-box, weighing not less than 800 lb.,



Near View of the Locomotive Which Exploded and Was Blown 75 Ft. The Drivers Were Stripped from the Axles But Held by the Side Rods

was hurled over the house tops and fell in an alley in the business section of the town, about 750 ft. distant. Another piece of about the same size fell in a street 900 ft. distant in the opposite direction. The locomotives standing on either side of the ill-fated engine were badly wrecked, one of them being moved bodily sideways and dropped into the turntable pit.

BIG IRON ORE BEDS HOLD A BILLION TONS

With the prospect of finding beneath the surface beds of iron ore estimated to contain a billion tons, mining experts are conducting a series of pumping operations in the comparatively new Baraboo district of Wisconsin. Mining has been carried on to a more or less greater extent in this district for some time past, according to *The Iron Age*, but the discovery of the large deposits of ore is of comparatively recent date. The Baraboo district lies in the southern part of Wisconsin and includes parts of Sauk and Columbia counties. It is 25 miles long and has a width of 2 miles at the eastern end which widens to 10 or 12 miles at the western and central portions. The area of the district is approximately 225 square miles and the chief rock exposures are a dense vitreous quartzite. This seems to form a canoe shaped body, the greatest depth of which from

the surface is estimated at 2,000 ft. Iron was discovered in the district 12 years ago after persistent investigations that were undertaken on the abandonment of the region by one company organized to extract the ore. The ore bed was effectually masked by a heavy bed of sandstone which is believed to account for the failure of previous operators to locate the ore. Several companies were formed and began operations. The ore taken out was found to have 55 per cent iron, dried, and about .045 per cent phosphorus. Operations by large corporations were then undertaken, one of them securing control of lands believed to contain more than 400,000,000 tons of ore, 80,000,000 tons of which is believed to be of the 55 per cent grade, and some 200,000,000 tons averaging 40 to 50 per cent, with the remainder better than 30 to 35 per cent. The ore as it stands in the ground is not especially wet, but in taking it out it becomes a pasty mass.

WASTE WOULD LIGHT HOUSE WITH ELECTRICITY

The average householder throws away each day enough garbage to light his house with electricity. From figures given by an English authority, it can be shown that if the garbage were destroyed in a refuse destructor and used to raise steam, there would be enough electricity generated to light six 16-cp. carbon-filament lamps continuously for three hours a day. If the more efficient tungsten lamps were employed, the equivalent of six 40-cp. lamps could be used for three hours a day.

England has seriously taken up this question of generating electricity from household refuse. Already there are in that country about 80 electric plants using this form of fuel, and they are increasing at the rate of 20 a year. The ashes from these plants are being used in the manufacture of concrete, paving bricks, etc., the profits from which go a long way toward paying for the cost of making the electricity.

RADISH PEEL A SENSITIVE DETECTOR FOR ACIDS

Every schoolboy learning chemistry knows that litmus paper turns red when put in an acid, and blue when immersed in an alkaline solution. Litmus, turmeric, methyl orange and other preparations are thus used for detecting the presence of an acid or an alkali. A German chemist has recently discovered that the extract of the peel of red radishes in alcohol is more sensitive than any of these detectors.

Experiments show that butter loses by evaporation about one per cent of its weight, during shipment and storage, in 7 days.

The third international aeronautical exhibition will be held in Paris sometime during the months of November and December this year, in the Grand Palais des Champs-Élysées, where it was also held last year.

THE GREAT BRONZE DOORS OF A CHURCH IN FAIRHAVEN, MASS.

The great bronze doors for the main entrance of the church and associate buildings given to the Unitarian Society of Fairhaven, Mass., by the late Henry H. Rogers, is one of the finest examples of the architectural and sculptural treatment of doors in America. The design is based upon English Gothic of the last or perpendicular phase. The doors measure 14 ft. in height by 8 ft. in width, and each leaf, with the exception of the statuettes, was cast in one piece, the whole weighing $4\frac{1}{2}$ tons.

The central feature on the outside is a figure of Christ in the act of benediction, set in a niche and sheltered by a canopy of intricate design, bearing four angelic heralds proclaiming the gospel message to the four quarters of the world. The central figure is flanked on either side by three of the apostles, six on the outer face, the other six being placed in corresponding positions on the inner face of the doors. Judas is not included, however, St. Paul appearing in his place.

Forming a frame around the doors on both the exterior and interior is a series of canopied niches filled on the exterior with figures representing great characters in the history of Christianity. The period from the beginning of the Christian era to the reformation is represented by great men of the Catholic church, while great reformers, members of the various Protestant bodies, represent the post-reformation period. The figures include Saints Clement of Rome, Mark the Evangelist, Luke,

Ignatius, Justin the Apologist, Athanasius the Great, Cyprian, Cyril of Jerusalem, Ambrose, John Chrysostom, Jerome, Paulinus of Nola, Augustine,



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Beautiful Bronze Doors Which Weigh $4\frac{1}{2}$ Tons

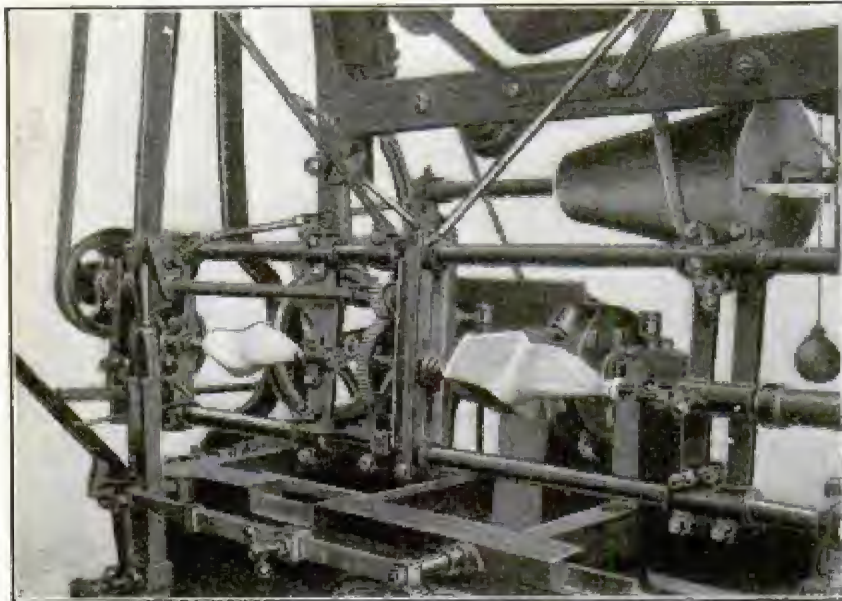
Leo the Great, Gregory the Great, Augustine of Canterbury, Bernard of Clairvaux, Bede the Venerable, and

Francis of Assisi; King Alfred, Thomas a Kempis, Savonarola, Wycliffe, Servitus, Melanchthon, Luther,

Calvin, Swedenborg, Latimer, Bunyan, Baxter, Williams, Wesley, Fox, Knox, Priestly, Parker, and Channing.

MACHINE MAKES MODEL FOR EVERY SHOE

This machine is used in France in making shoes to order. A plaster cast is made from a customer's foot or an



Making Forms for Shoes in Paris Shop

old shoe and placed between centers in the left side of the machine. The right-hand side of the machine then cuts out a wooden form or last according to the plaster model.

TELEPHONE POLES MADE OF OLD STEEL RAILS

A novel use has been found for old steel rails in building the telephone line along the railroad in the Isthmus of Panama. Set upright in concrete bases, these rails have been found excellent for use as telephone poles, and many of them are now doing duty in a climate where the ordinary wooden poles would be impracticable on account of the ravages of tropical insects. The concrete prevents rusting at the base, and provides such a good support as to render unnecessary the use of bracing or guy wires.

AUTOMOBILE MAINTENANCE FOR FIXED SUM

A new departure in the problem of automobile cost and upkeep has been introduced by an automobile manufacturer. This firm guarantees to maintain its cars for one, two or three years for a sum of from \$1,100 a year, this payment to include the services of a chauffeur, tire insurance and all expenses connected with the keeping and running of the car.

The same concern has another scheme for the upkeep of its cars. For a sum which is not to exceed \$25 the first year, \$37.50 the second year, \$50 the third year, and so on, it guarantees to execute all repairs due to fair wear and tear without any further obligation on the part of the owner.

WORLD'S LARGEST FAN VENTILATES MINE

It has been well said that the "heart" of a modern coal mine is the fan that furnishes pure air to the grimy workers underground, making it possible for them to continue their labors. Without this, the subterranean workings would become chambers of horror and death. Every mine in the United States has its ventilating system, but none has such a huge fan wheel as the great works of a company in Washington county, Pennsylvania. It is 35 ft. in diameter and 6 ft. wide.

It supplies oxygen to 5,000 miners. And it is very necessary that it work continuously; that it lose not a single "beat" of its mighty steel heart, for

just as the man of weak heart cannot do the work of one with a strong, normal heart, so the mine with inadequate ventilation cannot be expected to produce the amount of coal that a properly ventilated mine can.

This fan is made of heavy steel plates, none lighter than $\frac{1}{4}$ in., some being 1 in. in thickness. It is supported by two heavy "spiders" borne by portions of the shaft nearest the bearings. For driving the fan two specially constructed engines were installed, each one capable of operating the fan to its full capacity. An ingenious arrangement of friction clutches makes it possible to keep the wheel running continuously, one engine caring for the load while the other is being repaired. Much valuable time is saved by a mechanism in each engine room which applies and releases these clutches with ease and safety while the fan is revolving. While the fan oper-



Huge Ventilating Fan for a Coal Mine

ates as a blower, it is also provided with exhaust stack and reversing doors by which the ventilation may be reversed quickly and with ease.

MAKING MOVING PICTURES WITHIN THE ARCTIC CIRCLE

By W. T. PROSSER

Moving pictures have been made of many strange peoples and strange scenes, but only recently has life within the Arctic Circle, with its interesting tribes and animals, been successfully reproduced upon the gelatine films. The moving-picture expeditions sent above the temperate zone have had to face almost unsurmountable difficulties, and in the main the results have been discouraging.

A photographer who had spent many years in the Arctic regions, however, became interested in moving-picture photography, and, aided by his experiences under the difficult Arctic conditions, has met with success where so many before him failed. Two winters and a summer were spent by him in quest of scenes and events that would faithfully portray the northern Alaskan inhabitants. The result is nearly five miles of films, in which the natives may be seen in domestic scenes, hunt-

ing, at their sports, and in their religious observances.

A walrus hunt is one of the most remarkable features of the pictures. Some 900 ft. of film show a walrus herd estimated to number 100,000. They form a great black mass out in Bering Sea when the camera is first turned upon them, then successive pictures show them making their way slowly toward the shore. At the first crackle of the rifle they lift their heads out of the water and cock them to one side in curiosity. They sink beneath the surface when the bullets hit true, then the natives are seen quickly throwing harpoons and hauling them to the shore or attaching them to buoys while the hunt proceeds.

Not the least interesting series are those of the dog teams, indispensable beasts of haulage in the Arctic regions. The finest teams in all the North are gathered every winter at Nome to



Some of the 30,000 Reindeer Posing for the Moving-Picture Machine

start in the 210-mile race to Candle City. The eyes of all the North, from the great Treadwell mine in Southeastern Alaska, to bleak Point Barrow, are upon this event, and thousands of dollars in virgin gold are wagered on the event. The films show how the impatient dogs are harnessed, strain-

ing to be off; how the leader pulls and tugs, the signal and the start, with the snow flying in every direction, and the excited throng cheering.

The reindeer herds, which, imported from Siberia about nine years ago, are said to have increased from 700 to 30,000, are also shown. No one can



Stripping the Walrus Hides after the Hunt



Native Walrus Hunters with Trophies

tell exactly what a reindeer will do, and this relationship to the mule is suggested by their poses in some of the series.

From an ethnological point of view the moving pictures taken in the Arctic are of great value, for they will preserve animated scenes of the na-

tive life, which, before many years have passed, may lose its picturesqueness. Simple-minded as children, the natives bestow a blind faith upon Providence, and frequently fail to provide for the dark season. Hunting often proves poor and the tribes are in destitute circumstances.



Celebrating a Successful Hunt by the Seal Dance

ACETYLENE FLARES FOR AIRMEN

The drowning of Cecil Grace in crossing from the Continent to England, led Ogilvie, an English airman,



Acetylene Flare Which Bursts into Flame When Aeroplane Drops into Water

to attach to his machine a patent flare, which bursts into a brilliant flame when it comes in contact with water. It was carried by him when competing for the \$20,000 prize offered by Baron de Forest for the longest flight across the English Channel and into the Continent.

The flare is of the type used on life-buoys as an automatic rescue signal.

ANTIQUITY KNEW MICROBES AS CONTAGION BEARERS

That knowledge of microbes as carriers of contagious diseases is not entirely modern is borne out by the fact that in 1657, when the plague ravaged Rome, Athanasius Kircher, a Jesuit father, propounded the hypoth-

sis that the plague was caused by infinitely small animated bodies. In 1720, a French physician, embracing this theory, declared that these animated bodies were as small in proportion to a mite as is a mite compared with the size of an elephant.

GOVERNMENT GUARANTEE OF ANTIQUE FURNITURE

Under the new tariff, the matter of admitting old furniture free of duty hall-marks it in a manner totally unexpected by sellers and buyers of antiques. The tariff provides that if furniture is found to possess artistic value and be more than 100 years old, it is entitled to free admission, and this provision means that the admission free of duty constitutes a guarantee of genuineness which is of great value to the owner.

According to the government appraiser, the government demands the most positive proof of genuineness, and has experts to pass upon every object that comes in, not being satisfied with just the declarations of the owners. Much antique furniture has undergone repairs, consequently part of a piece may be old and part new. But antique furniture must be altogether old, not a combination of old wood and new wood made to look old, or it will not pass the sharp, expert examination and be admitted free.

NEW "ENGINEERING" PROFESSIONS

A paper recently started in Cleveland, Ohio, under the name of "Human Engineering" draws attention to a new profession called into being by conditions in the industrial world. This profession bears the same name as its publication and seemingly has to do with the human side of industry and the conservation of human energy. In the same way, ethical "uplift" work is often designated as "manhood engineering," and climbing in society as "social engineering."



This Carnation Produces White, Pink, Rose and Deep Crimson Carnations All on the Same Bush



Another Amazing Creation: Hybrid Trigridia, Greatly Improved in Size and Color

SOME STRANGE FLOWER CREATIONS

To produce white, pink, rose and deep crimson carnations all on the same bush at the same time affords perhaps the most unique demonstration yet given of the mutability of plant life when subjected to the process of creating a variation from the normal type through a scientific selection of the preceding generations of plants, and this is the unusual recent accomplishment of Luther Burbank.

At his experiment farms at Sebastopol and Santa Rosa, Cal., Mr. Burbank is constantly working out the evolution of new and commercially valuable fruits, grains and vegetables, and of new varieties of flowers through his selection from thousands of plants of those which depart from the normal type, or which show most strongly the characteristics which he desires to reproduce and make permanent.

One of his most promising developments is the Shasta daisy plant which



New Shasta Daisy Having Wonderful Blooming Qualities, Bearing About 400 Blossoms

bears more than 400 blossoms. The length of bloom has been greatly extended and the plant is probably the most remarkable daisy in the world.

Among other creations of his is a chestnut tree which bears its second crop of nuts at only 18 months from the seed. Mr. Burbank's earlier creations are well known. He is often called a "wizard," but this

term gives a wrong conception as to his methods. His plants are not produced in an instant but through years and generations of plant life.

¶The members of the Amalgamated Joiners and Carpenters of Great Britain have agreed not to use bicycles during working hours, fearing that their employers will begin to consider the bicycle as a necessary part of the workman's kit which the workman must furnish himself.

"AEROPLANE" MERRY-GO-ROUND

A curious merry-go-round, made to whirl by means of aeroplane wings waved by the riders, was one of the



Merry-Go-Round Revolved by Means of Man-Operated Wings

amusement devices at a recent theatrical exhibition in Berlin. The wings are waved slowly in a uniform direction until the merry-go-round starts to turn, after which it is easy to make it revolve at considerable speed by waving the wings rapidly.

CATCHING WHALES IN NETS IN NEW ZEALAND

The idea of catching whales with nets sounds preposterous, yet this is actually done every year by the Maori whalers in New Zealand. Between Solander Rock and the mainland is a channel through which a large number of sperm whales pass at a certain time each year. A special net formed of small cables instead of twine is set across the channel, and the whalers sit down and wait for the inevitable to happen. The whales swim into the net, become entangled in the huge meshes and flounder about until killed with lances.

Experts of the U. S. Geological Survey have calculated that in one year 2,428,313 lb. of arsenic is recovered as a by-product of smelting in the United States.

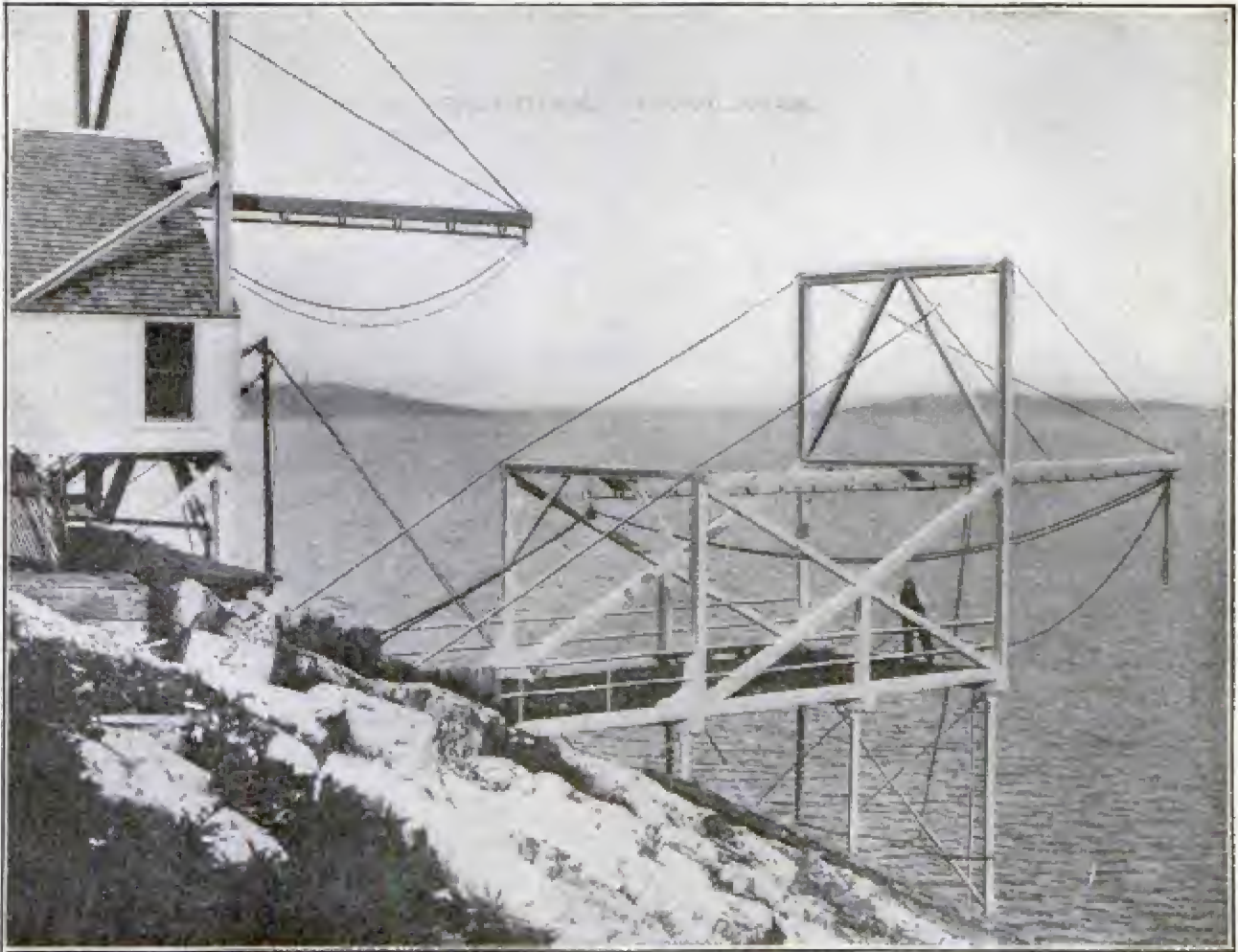
TELESCOPE SPECTACLES FOR EXTREME NEARSIGHTEDNESS



German Telescope Spectacles in Use, and Different Parts

Unique telescopic spectacles are being made at Jena, Germany, for use in cases of extreme nearsightedness. Each side comprises a large converging lens in front and a smaller diverging lens near the eye, the curvature of the two being such that, when the wearer looks at an object in direct line, the vision will not be marred by distortion or perceptible color effects.

Although the metal mounts are made as light as possible, the spectacles, which have no claim to inconspicuousness, weigh from one-half to three-fourths of an ounce. Tests of the spectacles show that those of small magnifying power are much to be preferred in the majority of cases. The spectacles most recommended increase the size of the retinal image about 30 per cent as compared with the natural image.



Method Adopted by a Massachusetts Light-Keeper to Land His Boat, Relaying It to House by Two Booms with Tackle

UNIQUE LANDING DEVICES AT LIGHTHOUSE

A curious arrangement is in use at Egg Rock Light, in Lynn Harbor, by the lighthouse keeper to enable boats to land on the island and keep up communication with the mainland. Frequently the water is so rough that boats, whether large or small, would be dashed to pieces on the rocky shores of the island. So the keeper has rigged a landing, built high on steel pipes sunk into the rock below the surface for several feet. This landing is rigged with a tackle and fall, hitched to the end of a frame, extending out over the water beyond the end of the landing platform. A pulley runs along a sort of trolley track and after the boat is hitched to the tackle, it is hauled up out of the water. It is then swung in over the platform and run, by means of the pulley and track, in to dry land. It can then be hooked to another tackle and hoisted still further inshore. If neces-

sary it can be run in to the house near the landing, kept for this purpose as well as for the storage of supplies, or, if the boathouse is already full, it can be stowed beneath the house, on a plank platform built for it. In this way, the light keeper is able to receive visitors and to receive supplies from the mainland. Otherwise he would be cut off from human companionship most of the time.

Recent experiments in Germany proved that drainage waters do not remove any more plant food from fertilized soils than they take away from unfertilized soils.

One of the most up-to-date factories in the world has recently been established in France by a Chinese. The majority of the workmen, also, are Chinese.

THE DUTCH GAME OF "KOLF"

The Dutch game of "Kolf," said to be fully as ancient as golf, which was



"Kolf," a Game of the Netherlands, is a First Cousin to the Familiar Game of Golf

first played in Scotland, is similar to golf in many respects. A quaint book of poems published in Amsterdam in 1719 contains an illustration of the game played in the open, but for at least 100 years it has been played in a court instead of on an open course. Instead of the ball being dropped into holes, the endeavor is to drive it against posts, with the least number of strokes.

GOLD-COATED CONTAINERS FOR FOOD

The cost of gold-plating metallic food containers is ordinarily prohibitive, but a process having the same effect has been discovered which may prove a rival to enameling. An iron vessel is treated with gold amalgam and the mercury is driven off by heat, thus leaving a coating which has the appearance of gold and also its powers of resisting the corrosive action of acids. Two ounces of gold will cover a ton of iron made into utensils.

SINGS AT HIS OWN FUNERAL

Although it is obviously impossible for a man to sing personally at his own funeral, the voice of William Henry Faxon, preserved by phonograph records, sang during the funeral rites over his body in the Methodist church of Ovid, Mich. The records were made two years ago when Mr. Faxon, who had been a church steward about 70 years, was 88 years old. The songs reproduced by the phonograph were: "What is Life," "All the Way," "Rock of Ages," and "I am a Pilgrim."

GUARDING PRISONERS FROM PUBLIC GAZE

When a patrol wagon, called a prison van in England, arrives at a police station in London with a load, screens are stretched across the sidewalk from the entrance to the curbing to protect the prisoners from the gaze of the curious public.



Screens Protect Prisoners from Gaze of Inquisitive Public in England

SAWDUST CONCRETE USED IN LIBRARY

Sawdust concrete was used in the construction of the new library building at Springfield, Massachusetts, as a base on which to lay the cork carpet covering the floors, the object being to obtain a foundation into which nails could be driven and in which the nails would hold. After several experiments, it was found that one part cement, two parts sand, and $\frac{3}{4}$ of a part sawdust would give the desired result. The thickness of the layer was 1 in., and 5,000 sq. ft. were covered.

NEW SWIMMING APPARATUS

The swimming apparatus designed by a German swimming master is both for trained swimmers and those ignorant of the art. When out of use, this apparatus is readily carried in the pocket. It consists of two oblong air cushions, each subdivided into five compartments which are connected together by transversal straps. Before putting on the apparatus, which consists of thin caoutchouc lined with a dense fabric, it is inflated through a valve, within a few seconds, by a few strong breaths.

Being arranged on both sides of the body, the apparatus leaves the head



Novel Swimming Apparatus Which Does Not Interfere with Movements

and neck perfectly free, thus doing away with any pendulating motions characteristic of most salvage apparatus. The person equipped with the apparatus moves about in the water with remarkable safety and stability. A special advantage of the apparatus is its allowing the swimmer at will to take up a vertical or horizontal position, thus enabling him to remain in the water for hours without fatigue.

IMPROVED TYPE OF SELF-DISCHARGING CAR

Fifty self-discharging hopper cars of a new design are now being used on the Buenos Ayres Western Railway



Self-Discharging Ballast Car Especially Designed for Railroad System in the Argentine Republic

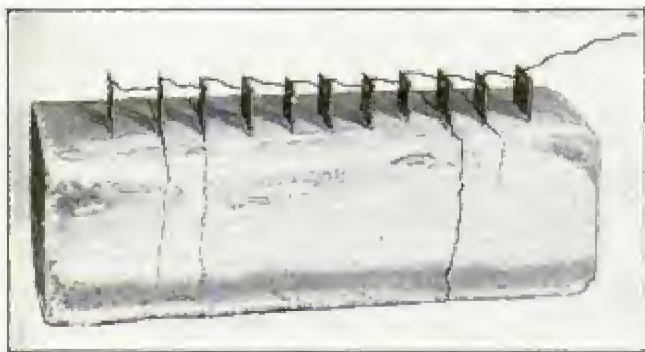
for the handling of ballast. The arrangement of the discharging mechanism is such that the distribution of the load may be regulated to a nicety at whatever speed the car is running. Each set of doors can be opened, regulated and closed independently of the others, so that the load can be discharged in the center, at one side or the other, or in the three directions simultaneously. The operating of the doors is entirely under the control of one man, standing on the platform of the car.

ELECTROLYTIC CORROSION OF METAL IN CONCRETE

When concrete has steel imbedded in it under such conditions that stray electric currents pass through the steel and



Test Block with Iron Rod Imbedded, Showing Size of Crack after Two Weeks' Exposure to Electric Current



Block Practically Disintegrated after being Submitted to Electrolytic Action for Two Months

from the steel to the concrete, as, for instance, might occur where steel building columns or the bases of elevated electric railway structures are so imbedded, electrolytic corrosion, of a nature which may, in time, crack the surrounding concrete, sets in.

Several experiments made in an endeavor to determine the extent of such

destruction and its action bear out the theory that the cracking and breaking away of the concrete is caused by the expansion of the metal due to electrolytic corrosion. Iron rust occupies more volume than the original metal from which it was formed, and as this rust must find space for itself, an internal pressure is set up as the amount of rust increases, until the confining concrete gives way.

A MILLION TONS OF SAND TO DRESS MARBLE

Sand is a very important factor in the marble industry. Smooth steel bands, moving to and fro, with sand and water pouring down from above, will eat their way through the hardest marble. Moreover, that same sand and water, when used upon swiftly revolving, horizontal steel disks, will take away all the roughness and irregularity from the slabs thus acquired. Of these requisite materials, a supply of water is usually near at hand, and steel may be shipped in from a distance, but the providing of the sand often proves to be a vexing problem.

To meet the demands of the mills at Proctor, Vt., it was necessary to build a tramway over the mountains. In the early days of the business, a few teams could haul all that was needed. Later, when that method became inadequate, a short tramway was constructed, but the limited supply within a half-mile radius was soon exhausted. Then someone discovered what might properly be called a mountain of sand. By extending the tramway $2\frac{1}{4}$ miles to the eastward, it would be possible to feed the mills for an indefinite period.

Accordingly, a pathway was blazed up through the timber land, the standards were raised, and the cables were put in place. Then, one by one, the buckets were attached and sent forth on their endless journey. That was ten years ago. At the present time, the tramway is still in operation and

the buckets never come back empty, although 17 acres have been lowered to a great depth.

Each of the buckets weighs 300 lb. and has a capacity of 500 lb., and so quickly are they filled and emptied that they move along the cable at the rate of one every 50 sec., or 72 an hour. The buckets are operated about 18 hours a day. Thus it will be seen that within the past ten years about one million tons of sand have been moved down into the valley.

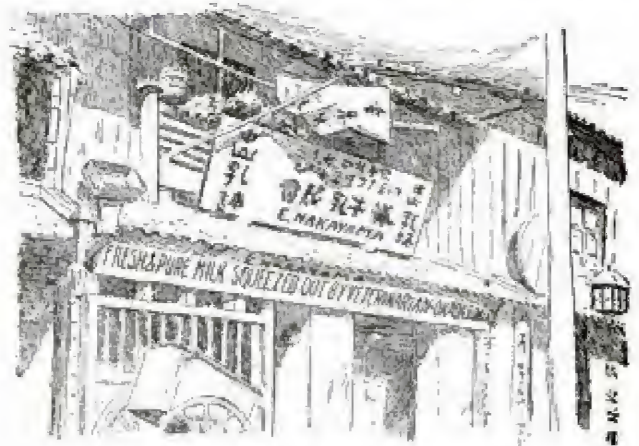
INFLUENCE OF SPEED ON COMPASS NEEDLES

It is known that during long voyages in either an easterly or westerly direction, the hulls of steel vessels become magnetized in a manner which will affect the needle of the compass, one side of the hull developing a negative pole, and the other a positive. A French scientist, who has studied this phenomenon in its relation to speed, finds by observations on rapidly moving trains that the same tendency exists in steel cars and that the amount of magnetization varies directly with the speed. Also that the magnetism does not disappear at once when the trains stop.

From these experiments, it would seem that the compass needles on fast ocean liners are more liable to be affected by steel hulls than those on slow steel ships.

"PURE MILK SQUEEZED OUT"

The naive manner in which the Japanese mistreat the English language

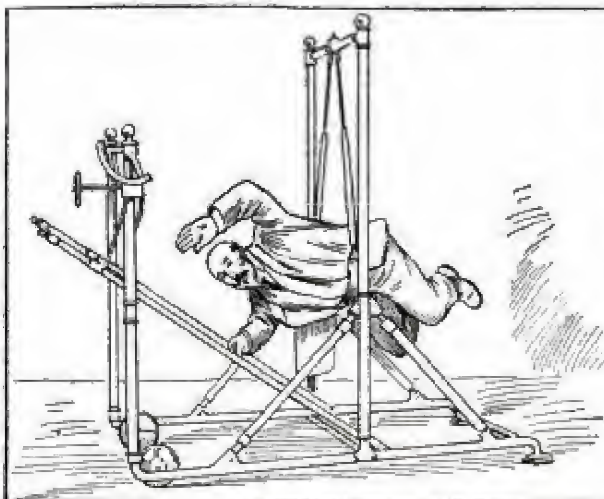


"English As She Is Wrote" in Japan

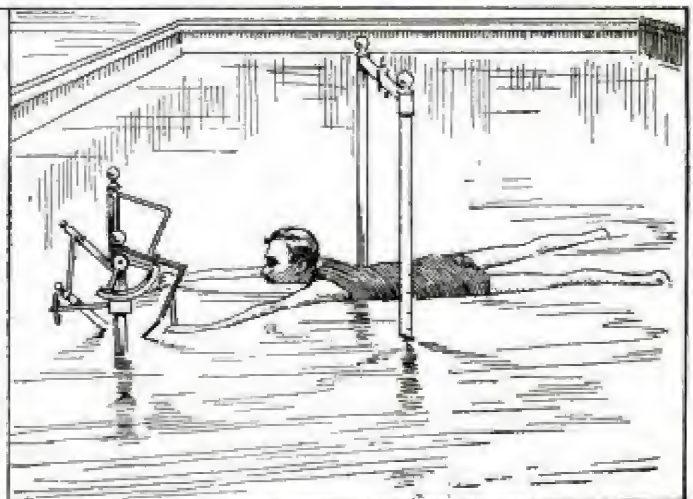
on shop signs is often laughable, as is well demonstrated by this sign over a dairy in Kyoto. The sign reads, "Fresh and Pure Milk Squeezed Out by Veterinarian Okadas Dairy."

SWIMMING MACHINE

A swimming apparatus which may be used on land as well as in the water as a means of teaching beginners how to swim has been designed by a London physician. The person learning to swim is slung on an adjustable support which provides balance and comfort. In front of the sling is an adjustable ladder-like frame, the bars of which are grasped when some additional support is necessary to keep in a horizontal position.



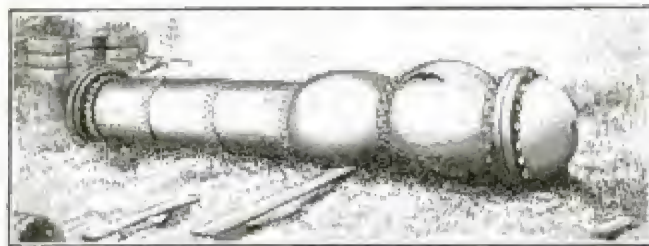
Practicing the Side Stroke on Land



Learning to Swim in the Water

AMMONIA-TANK EXPLOSION LESSON IN BOILER DESIGN

This illustration, showing an ammonia tank which exploded during a recent fire in an ice-manufacturing



Stiff Girth Joint Prevents Violent Explosion

plant in Coffeyville, Kans., furnishes an important lesson in boiler design. It will be noticed that although the first and second sections of the tank were bulged out from a cylindrical almost to a spherical form by the expansion of the heated ammonia, the girth or circumferential joint between these sections retained practically its original diameter. Thus the stiffening effect of the girth joint proved of the utmost importance, as it prevented a violent explosion instead of the merely local burst seen in the illustration.

RAILWAYS NEED STANDARD OF EQUIPMENT

To the list of the needs of mankind has recently been added the standardization of railway equipment. In all sections of the country, and in all branches of industry, the necessity for a general standard of equipment is keenly felt. The railroads themselves have recognized this in laying their track so that the cars belonging to one company can safely be carried on the rails of another. But the matter of making the cars themselves conform to a uniform system has not made the headway it deserves.

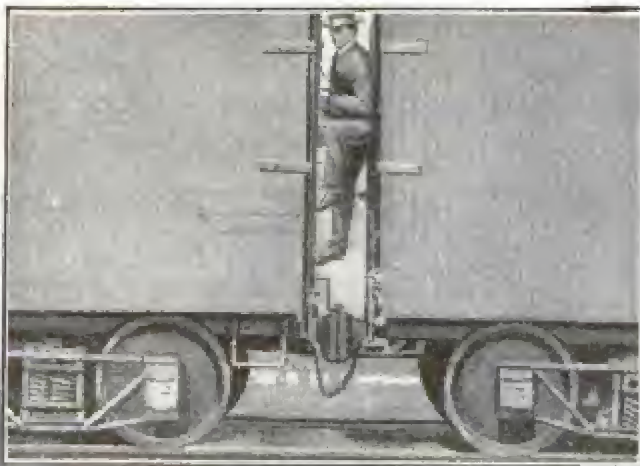
In the passenger department there is so great a demand for high quality of service that the railroad companies advertise widely on the strength of the superior accommodations offered to the traveling public. Any corporation falling below the standard set by keen competition naturally loses business. But the freight equipment is another thing, and it is the freight business that brings in the returns on which depends the livelihood of the great army of railway employees.

There are more types of freight cars in use in the United States than there are railroads doing business.

On some roads there are to be found several styles of cars. Such a conglomeration of equipment makes the average freight train not only a queer-looking procession of car-builder's samples, but in many cases is

actually a menace to the men employed to operate it. A freight train is seldom made up of cars belonging to one company. On the contrary there are many trains that contain but one or two cars owned by one corporation and sometimes all of these are traveling over rails and operated by crews of another company.

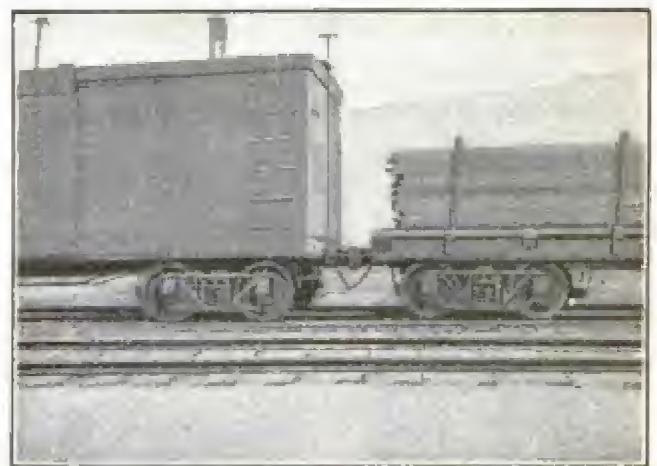
In an inspection trip of 1,500 miles undertaken recently by an investigator interested in this subject, photographs were made of some of the most glaring deficiencies resulting from lack of standardization. Sandwiched between cars equipped with air brakes would be found cars having only hand brakes. Frequently the method of attaching the coupler would be such that the space between the cars would be so great as to make it impossible for the brakeman or conductor to reach the hand rail on the other side, and often cars with the box end built flush with the end of the deck would be encountered, leaving no piece on which the brakeman could stand or get footing in passing from car to car. In several instances, cars built as described above came so close together in coupling that it would be a tight squeeze for an ordinary man to get his body between them. The building of the decks of some cars wider than others also holds its menace. A man inspecting a car on the ground is in danger of being "side-



Narrow Space Between Car Ends Caused by Building Box Cars over Entire Deck

swiped" by a passing train under such conditions.

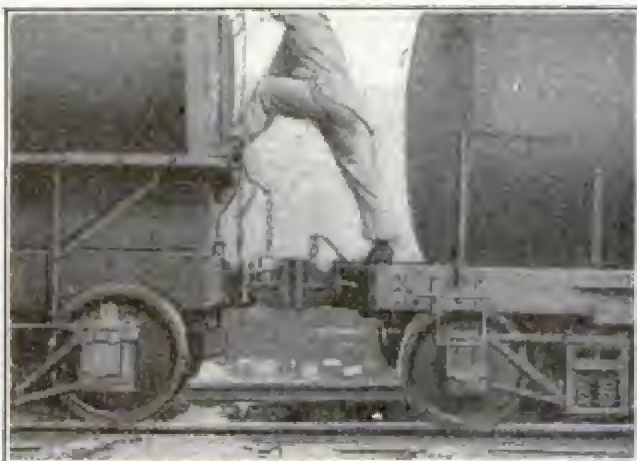
Possibly the greatest danger and inconvenience are caused by the different designs of tank and gondola cars. In



Car Built over Entire Deck Having Side Ladder Coupled with Flat Car

cars, the man who attempts to go from one to the other while the train is in motion takes his life in his hands.

The same situation presents itself in going from a box car to a tank car,



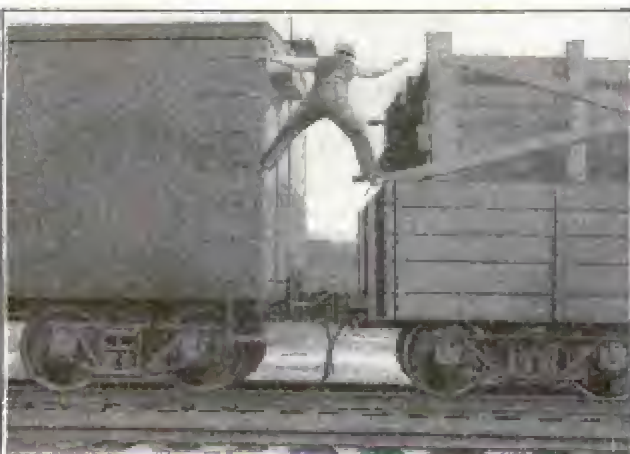
Difference in Height of Deck of Tank Cars

some instances, it has been found that the deck of a tank car of one type would be from 2 to 3 ft. higher than the deck of another type, and when there is also a wide space between the



Wide Step from Side Ladder to Tank Car

when the former is built flush with the deck and has only side ladders instead of end ladders, and the latter has a high deck or a gondola, the end of which is also flush with the end of its deck.



Another Wide Step from Side Ladder Car Which Endangers the Brakeman's Life



Narrow Space Between Trains Due to Cars of Different Width

"DOCTORING" CIRCASSIAN WALNUT

The beauty of the grain in Circassian walnut is generally enhanced by the presence of sound knots, and, real-



Plugs Taken from Doctored Circassian Walnut

izing this, the Turks often resort to timber doctoring of a kind that fools the buyers, but is almost sure of discovery when the wood is prepared for use.

In the illustration are shown two plugs, or imitation knots, found in a log of Circassian walnut at a plant in Cleveland, Ohio. The log evidently contained hollow knots, which were carefully cleaned out, and then the wooden plugs were hewed out to fit the cavities and driven in tightly. The plugging was done so carefully that the lines about the plug were not considered as more than a small ring shake.

That importers of valuable woods may suffer loss through other reasons than dishonesty, however, is borne out by this rat story: A New York importer recently purchased a Circassian log which weighed 3,000 lb., and to all appearances was solid, although seeming a little light for its size. When opened, preparatory to converting it into veneers, it was found to be a little more than half hollow. A small hole that at first had been taken for a sunken knothole was found to lead into

the cavity, which was filled with pieces of rags, paper, nuts, leaves, etc., and in the midst of this rubbish was an old gray rat.

X-RAY ADMITS CHINAMAN TO COUNTRY

A question of age, having to do with the eligibility of a Chinaman to enter the United States, was determined recently at Boston by means of an X-ray test. Photographs were taken of the wrist and knee bones by the radiographic method at the suggestion of the Chinaman's counsel, who, it is said, thereby proved his client to be only 17 years of age instead of 25, as claimed by the immigration officers.

BED CANOPY AS PICTURE BACKGROUND

Several novel ideas have been incorporated in the arrangement of this Louis XVI bedroom, which is in the home of a famous Parisian prima donna. The coverlet and the hangings and panels at the head and foot of the bed are of fine old laces of great value. The canopy over the head of the bed is utilized as a background for small paintings and photographs.



Louis XVI Bedroom in the Home of a Parisian Prima Donna



SCIENCE AND MECHANICS IN THE MIDDLE AGES

No. 4—THE PRINTERS.—The printing presses used about 1500 were, of course, very crude, but excellent work was done, considering the difficulties. Presswork and composition as done in 1520 are shown in the illustration, the press being of the screw type, with a contrivance for running the form of type under the point of pressure. Pressure was applied by turning the screw.

No. 5—THE PAPER-MAKERS.—The interior of a paper mill of the sixteenth century is shown in the accompanying illustration. The first maker of paper in England whose name is known, was Tate, who set up a mill in Hertford about 1520. The first paper mill in America was erected in 1690 by William Rittenhouse in Roxborough, which is now within the corporate limits of Philadelphia.

NEW YORK DOCK PROBLEM TEMPORARILY SOLVED

The problem of docking the big Atlantic liners in New York has been temporarily settled by the granting of a permit by the United States Government for the extension of the piers of the International Mercantile Marine Company on each side of one of its slips. This will permit ships like the "Olympic" and "Titanic" to go alongside the dock with none of the stern protruding into the North River channel in an unprotected manner, but the permit does not contemplate permanent extension. It is expressly provided that the additions made to the

piers shall be of a temporary character which will be allowed to remain in place at the discretion of the Secretary of War. On his order it must be removed immediately.

The final solution of the difficulty of docking big ships is still to be found, and while a number of plans have been presented, there has been no definite scheme formed. All of the interests in New York and New Jersey involved in transatlantic commerce realize that the time is coming when permanent docks for the great ocean ships must be provided, and they are bending their efforts toward the formulation of a plan that will meet all needs and be acceptable to all the interests.

FLEAS FROM MADAGASCAR TRAINED TO ACT

Among the interesting immigrants that have settled in the United States during the past few years is a colony



Madagascar Fleas Performing Evolutions at the Word of Command

of fleas from Madagascar that are at present living in a small town in Maine. Whether or not these interest-

ing natives of the big island came in to this country as specimens of natural history or artists is not known, although their accomplishments at present would give them title to entrance under the latter head, as their guiding genius declares they are the best educated community of fleas in the world. He endeavors to prove his point by putting his charges through military evolutions and a series of maneuvers at the word of command that give credence to his claims. The fleas are rather large in size and their performances are said by those who have seen them to be most interesting. Their education and training was accomplished with much skill by their present general manager into whose hands they were placed by a sea captain who had been their guardian on the long voyage from their native haunts to America.

REMOVING A MOUNTAIN TOP

If someone were suddenly to shoot off 16 tons of dynamite and giant powder on the next block, you might reasonably expect to feel some slight surprise, if not actually to see windows break and hear the dishes dance. Yet if the explosion were contrived in the refined and considerate fashion recently used by engineers in removing the top of Roseville Mountain, in Morris County, New Jersey, the chances are that you would know nothing at all about it unless you saw the smoke.

Eastern experts who flocked to the scene to witness the clearing away of the last obstruction to the D. L. & W. railroad's new \$13,000,000 cutoff, counted upon an incredible noise and violent earthquake tremors. They were disappointed in both respects; the explosives were too busy lifting 19,500 cu. yd. of rock to bother about making much noise.

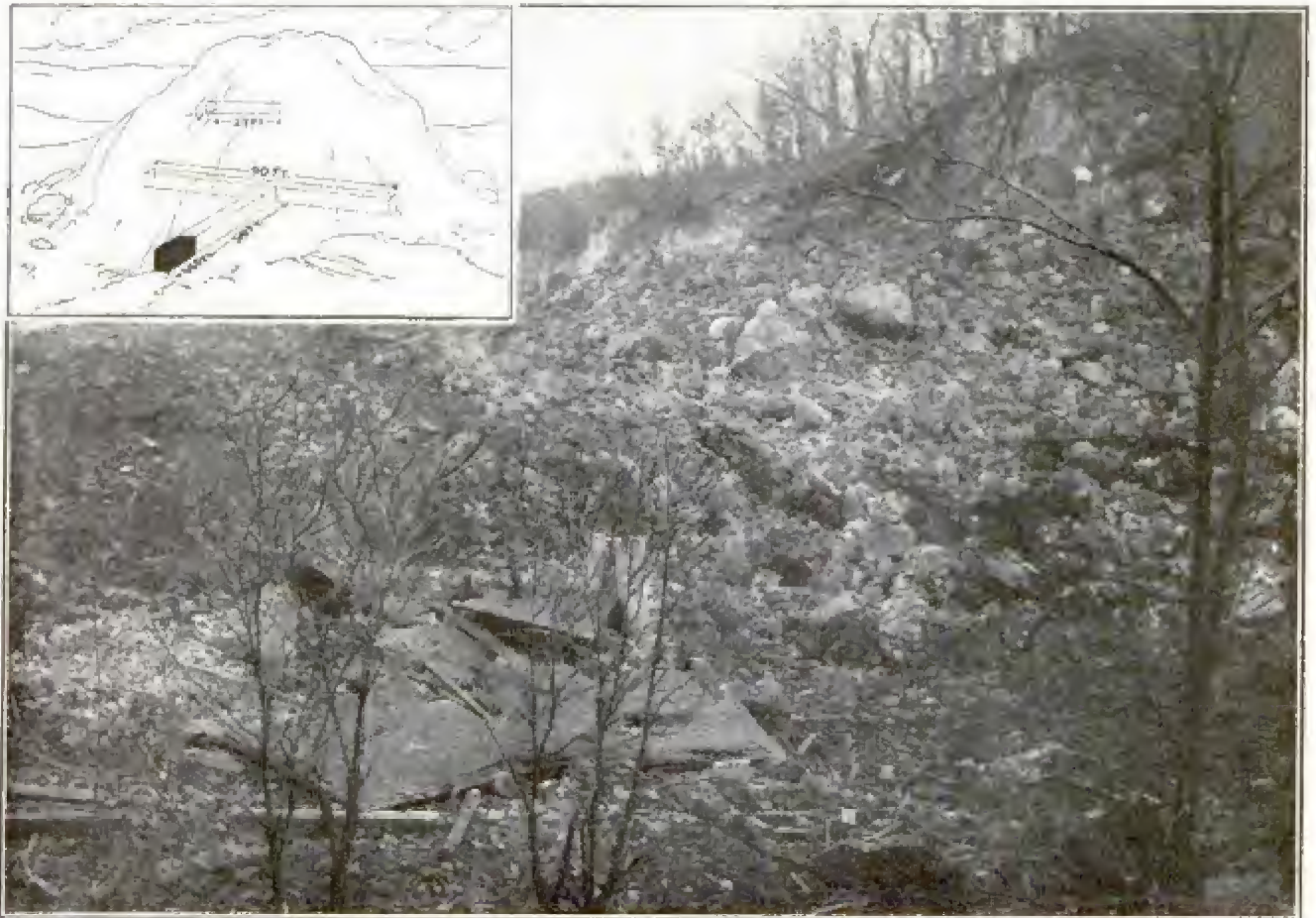
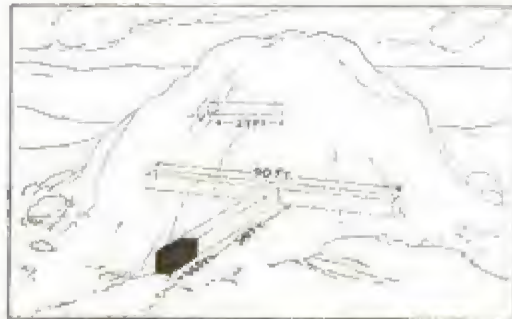
Instead of sinking wells into the mountain top for the reception of the explosives, the contractors had built a horizontal tunnel, 4 by 6 ft., running

73 ft. into the side of the hill, about 30 ft. from the top. This was crossed at the end by another tunnel, 90 ft. in length; and nearer the surface another transverse, 27 ft. long, had been constructed. The 90-ft. tunnel was packed with Judson railroad powder, an explosive slower than dynamite and with greater lifting power. The 73-ft. tunnel was packed with Judson and dynamite, alternating with tampons of sand and stone. The short tunnel was filled with 60-per cent Red Cross dynamite, and the mouth of the main tunnel closed with a cement wall 14 ft. thick.

The blast was, of course, exploded by electricity. There followed a low, ominous rumble. A mighty smoke cloud rose to a height of some 200 ft.; hundreds upon hundreds of tons of rock, of workable size, rolled into the valley—and it was all over. The only building to suffer was the little Roseville schoolhouse, which had stood at the foot of the hill since long before the Revolution, and which was a total wreck after the blast.



Blowing the Top Off of a Mountain with Dynamite at Roseville, N. J.



A View of the Erstwhile Mountain Top after the Explosion, the Wrecked Schoolhouse in the Foreground
—Diagram Shows How Dynamite Tunnels Were Dug and Sealed with 14-Ft. Wall of Concrete

NEW POSTAL VENDING MACHINE

A simple and ingenious picture-postcard vending machine is shown in this illustration.



The purchaser of postals turns the drum until the card desired is behind the releasing device, drops in a penny, and turns the crank operating the releasing mechanism of the row containing the card, thus causing it to drop out of the slot.

CM. Henri Deutsch, one of the leading French patrons of aviation, has ordered of Blériot an aeroplane with four seats completely inclosed like the limousine body of an automobile.

riot an aeroplane with four seats completely inclosed like the limousine body of an automobile.

WARSHIP A BOER BOY'S MIND'S EYE SAW

How is a battleship pictured in the mind of a person who never saw one?

There are few people who do not form ideas of the appearance of things in common usage long before they see them. Battleships are matters of everyday report, their cruises and maneuvers filling columns of space in the daily press. Millions of Americans have never seen a real battleship in their whole lives, just as millions have never seen the ocean. Photographs of the most intimate character showing the construction of ships of all classes are common property, however, and the mind of almost everyone has pic-

tured a battleship or a cruiser time out of time. It is not everyone, however, who can crystallize this mental picture into a tangible model. This is what a little Boer boy has done in South Africa. He tells how in the following letter to the editor of Popular Mechanics Magazine:

Heidelberg, Transvaal.

Editor, Popular Mechanics,

Dear Sir: The enclosed is a photo of a model Dreadnought made by myself entirely. I am aged thirteen and have never seen a battleship in reality. The hull is of wood covered with paraffin tins cut and riveted together. Size of vessel $4\frac{1}{2}$ feet by 13 inches. The general information I obtained from Popular Mechanics and two patents I made myself, such as a protection for life boats and working of search lights. I have named it H. M. S. "Superb." The vessel is complete with wireless



Boer Boy's Battleship Model

telegraphy, guns for firing at aeroplanes and everything required on a ship of its nature as far as my knowledge goes.

Yours sincerely,
Wyville Botha.

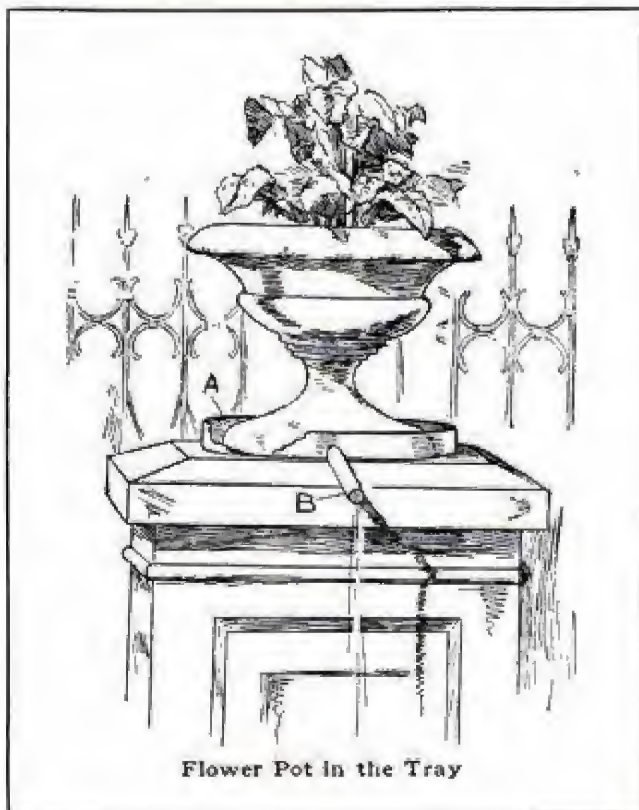
¶The first two American airmen to make aeroplane flights in Japan are Captain Baldwin and Airman Mars, who gave their first exhibition at Osaka recently.



Flower Pot Drain

The staining of woodwork on porches and posts caused by the dripping of water from flower pots can be prevented in the following manner:

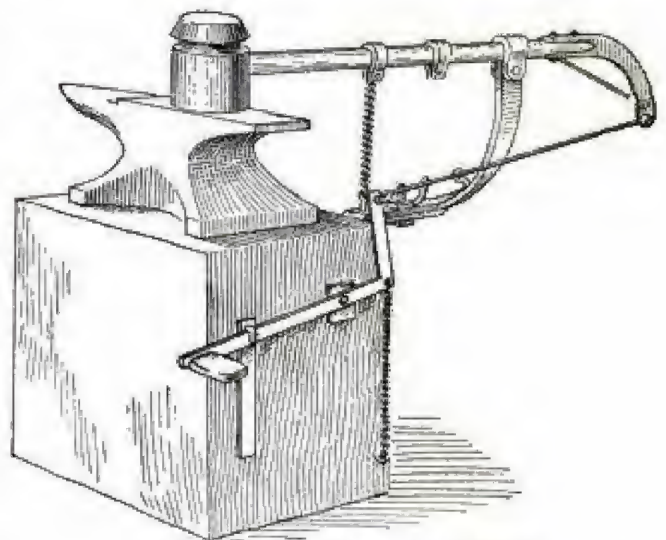
Make a zinc or galvanized tray of suitable shape in which to set the pots, as shown in the illustration. Solder a tube for the overflow, or dripping, on one side of the tray. Have the tube long enough to clear the post or part of the porch where the flower pot is set. The tube may be placed to the rear so it cannot be seen from the street, if desired. Place some small pieces of wood beneath the tray to allow the passage of air, thus preventing moisture. The tray can be made in any shape to conform to the shape of the pots.—Contributed by Dr. D. D. Smith, Sandusky, O.



Flower Pot in the Tray

A Foot-Power Hammer

The hammer is fitted with a heavy wood handle to which a curved piece of iron is attached with clamps, and



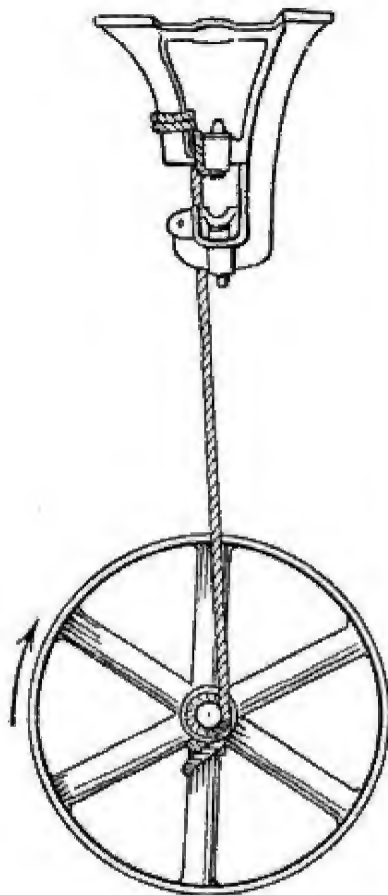
Hammer Attached to Anvil Block

braced with a rod as shown. The yoke at the fulcrum is fastened securely to the handle and also to the bar-iron brace. The brace is attached to an L-shaped bracket on the anvil block, so it can be raised and lowered to permit the hammer to strike with the face parallel to the work. The bell-crank lever is attached to the side of the anvil block with the foot piece near the operator. If several holes are drilled in the top part of the bell-crank lever, the length of the stroke can be adjusted.—Contributed by A. Walle, Ludington, Mich.

CA good way to remove whitewash is to soak it thoroughly with concentrated lye and then use a wire or hard-bristled scrubbing brush. If the lime was put on in a hot condition, it may require more than one such application to remove it entirely.

Raising a Countershaft

The method I used in putting up unassisted a heavy countershaft for a planer is shown in the sketch herewith. I tied a rope to each hanger



and fastened their lower ends to the shaft. I turned the shaft by means of the large pulley, thus wrapping the ropes around the shaft and raising it to the bearings. The shaft was lifted into place with surprising ease.—Contributed by Harold M. Ilg, Lowell, Mass.

Reclaiming Scrap Solder and Lead

We had occasion to clean up the season's accumulation of scrap solder and lead, and after separating the two metals we found it necessary to melt them and run into a convenient form for handling.

An old range boiler of 30-gal. capacity was cut in two, and seven or eight holes 2 in. in diameter were punched in the side about midway between the top and bottom of the lower half. The lower end of the tank was then placed in the ground in a hole about 1 ft. deep and tamped carefully to make it solid. The interior of the tank was then filled with dirt up to the holes that were punched in the sides. A coke fire was placed in the tank and a cast-iron soup kettle placed on top of the coke and filled with metal. The dirt was skimmed off from the top of the melted

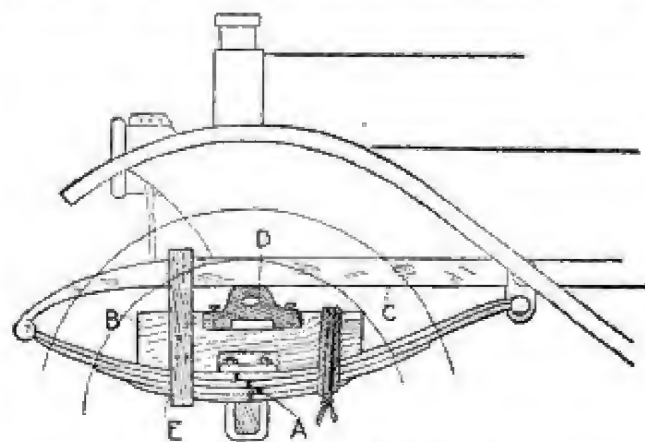
metal and the clean metal was poured into molds. We found it to be the quickest and best method we had tried.—Contributed by W. W. Hughs, Minneapolis, Minn.

How to Clean a Straw Hat

A simple and inexpensive straw hat cleaner may be made by dissolving 1 oz. of oxalic acid crystals (these can be purchased at any drug store) in 1 pint of boiling water. After the liquid has cooled, it should be shaken thoroughly and then applied to the straw hat with a small nail or tooth brush. Apply copiously and briskly and then rub dry with a clean cloth. The hat should now be pressed with a hot iron over a dry cloth so as to preserve its shape, and when thoroughly dry, it will be as clean as a new hat. This cleansing mixture is the cheapest and most effective known, as the quantity mixed is sufficient for a dozen hats.—Contributed by W. B. Lippard, Buffalo, N. Y.

Emergency Repair on an Automobile Spring

The front spring of an automobile broke while on a trip and it was repaired in the manner shown in the



Spring Supported with Wood

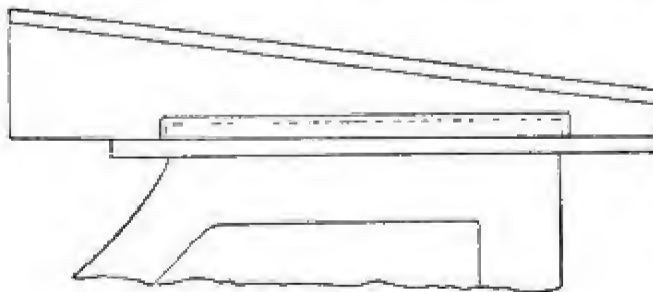
sketch. The car was raised with a jack above its normal position and the various leaves of the spring were placed end to end at the fracture A, and the U-bolt clamp drawn tightly down on

them. A piece of 2 by 4-in. pine, B, was procured from a farmer, and, with the aid of a borrowed hatchet and a handsaw, it was cut to fit the curvature of the spring as shown, the top part of the block being left straight. A slot was cut into the block to receive the rubber buffer D, which was held in place by two nails, driven through its flanges and into the wood.

A 1 by 2-in. strip of wood, E, was nailed on each side of the spring near the front end, and a rope wound several turns around the rear part, to hold the piece B in place. When the jack was removed, the frame rested on the rubber buffer. A journey of 50 miles was made over dirt roads without trouble.—Contributed by F. C. Holly, Yazoo City, Miss.

A Partnership Desk

Where office space is limited an arrangement by which two men can work



Another Desk on Top

at the same desk will be found of such advantage as to repay the trouble of constructing an extra top, as shown in the illustration. The top board is very convenient for a bookkeeper or draftsman. The construction is self-explanatory. The addition is secured to the top of the desk by two strips which engage with the projecting ends of the desk top. The strips are screwed to the side boards of the addition after the latter is in place. Small strips of blotter should be laid on the desk on the part where the addition rests, to avoid marring the polished surface. Any desired height may be obtained by varying the width of the two side boards which support the false top.—C. W. Nieman, New York City.

Joint for Aeroplane Construction

A very simple, light and inexpensive joint for the framework of aeroplanes

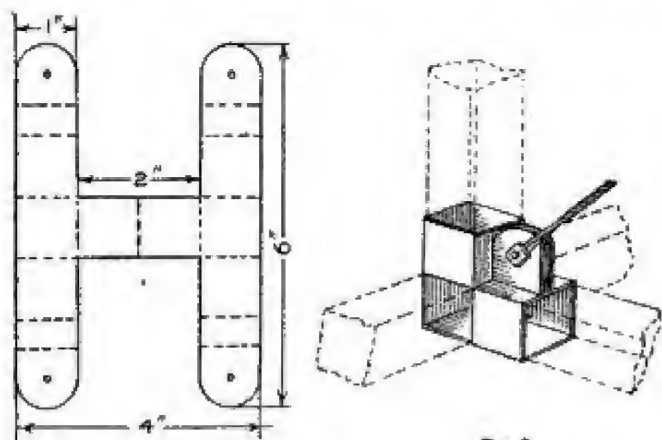


Fig. 1

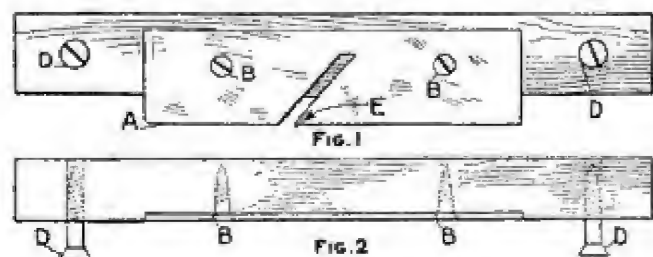
Fig. 2

Made of Sheet Metal

may be made of sheet brass or aluminum, about 22 or 24 gauge. The sheet metal is cut to produce the shape with the dimensions shown in Fig. 1. After bending the metal on the dotted lines it will take the shape about the joint as shown in Fig. 2. The bolt used for holding the ends of the wire truss clamps the ends of the metal together, thus making a solid joint. This joint is especially adapted for use on aeroplanes built of square material.—Contributed by Henry C. Wood, Toronto, Canada.

A Small Plow Plane

A plane for cutting small grooves in wood may be made in the following way: Saw a slot in a piece of steel, A, Fig. 1, and then turn down the edge E. Drill two holes, B B, for screws to attach the steel to a block of wood.

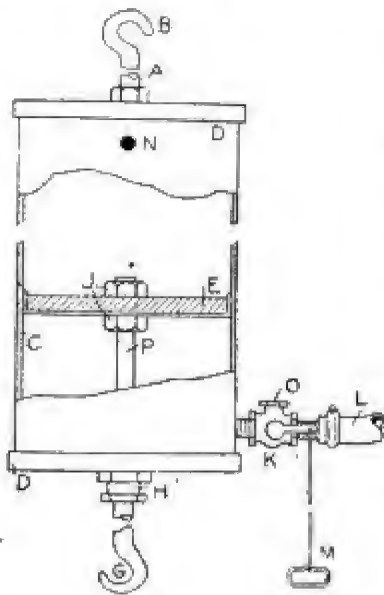


Metal on Wood Block

Guides for the plane are made by turning two large screws in part way, as shown by D D, Fig. 2.—Contributed by Geo. Madsen, Chicago.

An Air Hoist

Procure a piece of 1-in. cold-rolled steel, A, and bend a hook, B, on one end. Thread the other end for a standard 1-in. nut.



Take a piece of 4-in. steel pipe, C, of the desired length, and thread it on both ends for pipe caps DD. Bore out the pipe C so that the internal walls are straight and smooth. Make a piston, E, $\frac{3}{4}$ in.

thick and $\frac{1}{64}$ in. smaller in diameter than the inside diameter of the pipe C. Turn up a leather disk about $\frac{1}{4}$ in. thick and $\frac{1}{1000}$ in. larger than the inside diameter of C. Drill a $1\frac{1}{4}$ -in. hole in the center of the piston and the leather disk.

Make a piston rod, P, by turning down a piece of $1\frac{3}{8}$ -in. round cold-rolled steel to $1\frac{1}{4}$ in. in diameter and bend a hook, G, on the end. Turn a packing gland, H, into the pipe cap D and push the piston rod through the gland and cap and assemble by means of the lock nuts J. Screw the pipe caps DD in place, making the lower one airtight with a gasket.

Drill and tap the cylinder for a $\frac{3}{4}$ -in. pipe just below the lowest point of the piston travel. Connect a two-way valve, K, by means of a nipple and a hose, L. Make a control rod, M, to operate the valve, and drill a $\frac{1}{2}$ -in. hole, N, in the cylinder. After the hoist is connected and the parts fitted together, take it all apart, clean and oil thoroughly and then reassemble, making all fittings secure and tight.

The hoist is operated by pushing up or pulling down on the rod M. When the rod is up, the air is admitted from the hose L through the valve K, and

into the cylinder. When the control rod is pulled down, the air is allowed to escape through the valve opening O.

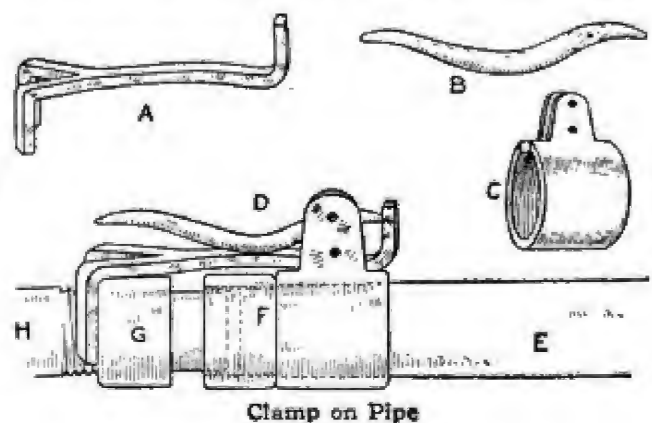
This hoist can be made cheaply and used wherever compressed air is obtainable. It will lift 700 lb. with an air pressure of 60 lb.—Contributed by F. B. Hays, St. Louis, Mo.

Clamp Coupling for a Water Pipe

A water pipe coupling had to be disconnected frequently, and, as it took some time with the ordinary screw coupling, I designed the following described joint:

The parts consist of a draw bar, A, made of $\frac{1}{2}$ -in. square bar, a lever, B, also made of $\frac{1}{2}$ -in. stock, and a split collar, C, which was made from sheet metal rolled into shape. The assembled parts are shown by D. An ordinary coupling was cut in half and the pipe E turned into the part F for about one-half its length. The other part, G, was turned on the pipe H, after some of the threads were filed off at the end, so that it would enter the coupling F freely. A small rubber gasket was placed in the coupling F to make a watertight joint.

To connect the pipes, pull the draw-bar back toward the pipe H, lift up and hook it back of the coupling G, at the same time placing the end of the pipe H into the coupling F. Pull the lever



Clamp on Pipe

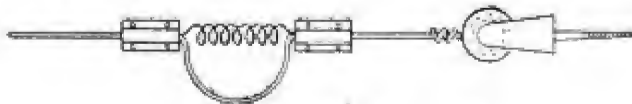
down and the parts will be drawn tightly together. The degree of pressure may be regulated by turning either half coupling.—Contributed by Thos. L. Parker, Olaf, Iowa.

How to Make Stamp-Pad Ink

Some typewriters and all rubber and metal stamps require the use of a special ink which is sold in small bottles. This ink is sometimes hard to obtain, especially if the address of the dealer is not at hand. It may be made at slight cost by dissolving the point of a common copying or indelible pencil in glycerine. Put a few drops of the glycerine into a bottle and stand the pencil in it after having cut the wood well back from the "lead." It will immediately begin to dissolve, and after a day or two the ink will be ready to use. The pencil will make a convenient tool for applying the ink to the pad or roller.—Contributed by Frank N. Blake, N. Adams, Mass.

Noise Caused by Service Wires

Several complaints came from my customers who claimed they could not sleep on cold nights owing to the noise caused by the service wires, says a correspondent of the Canadian Electrical News. I have tried several times to overcome this trouble and finally with success.



Removing Strain on Wires

A $\frac{1}{4}$ -in. spring wire was coiled $1\frac{1}{2}$ in. in diameter by 10 in. long and placed on the wire with two clamps as shown in the sketch. This takes the direct strain off the side of the house which acts as a sounding board.

Cranking an Automobile by Foot Power

The sketch herewith shows a device for use on an automobile to start the motor by turning the shaft with the pressure of the foot on a lever. While this device may not be efficient on large cars, it will work successfully on small machines. The parts connected to the machine are shown in Fig. 1. The drum C, Fig. 1, which should be

about 6 in. in diameter, is made up of parts as shown in Fig. 2. The casing G encloses a spiral spring, F, and the

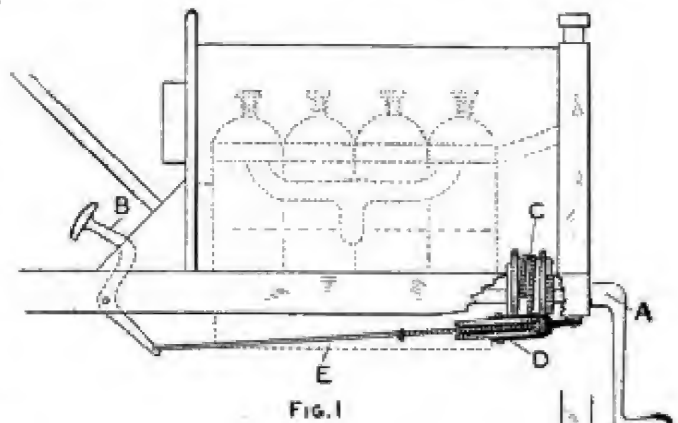


Fig. 1

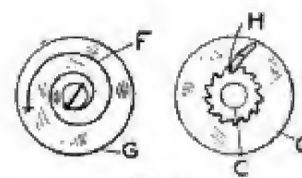


Fig. 2

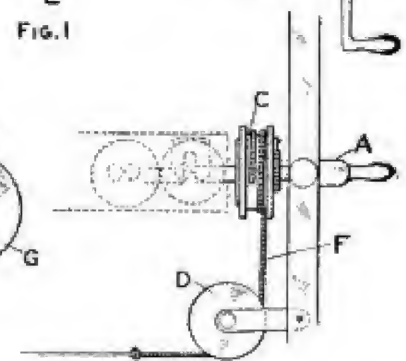


Fig. 3

Foot Starting Attachment

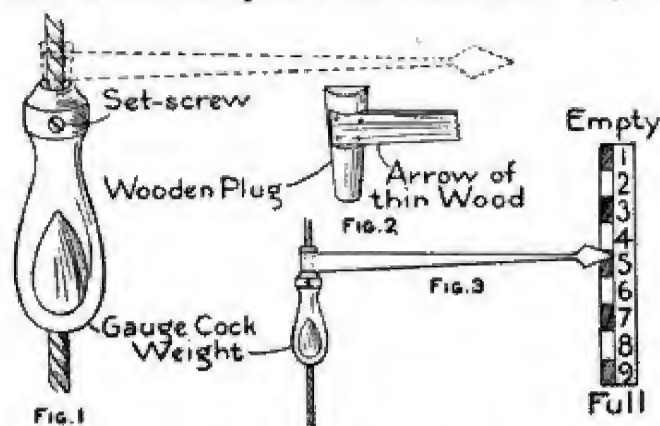
ratchet wheel H is fitted to the motor shaft C so it will disengage the same way as the ordinary crank A, Figs. 1 and 3. The drum C is turned with a bicycle chain, F, Fig. 3, which is connected to the foot lever B by a wire, E, Fig. 1. The idler wheel D, Figs. 1 and 3, can be placed in a suitable position to carry the chain to any desired place for the foot lever B, Fig. 1.—Contributed by D. H. Fairchild, Pana, Illinois.

How to Cut Brass Tubes with a Hacksaw

Place two blades in the saw frame, one in the usual way and the other reversed so that the teeth will point back toward the handle. One blade will cut while the saw is pushed forward, and the other makes its cut when drawing the saw back. While one blade is dragging, it will prevent the other from taking too deep a cut in the metal.—Contributed by H. D. Chapman, Washington, D. C.

Weight and Indicator for Tanks

The weight end of a gauge cock, Fig. 1, makes one of the best weights for a counterpoise or indicator rope,



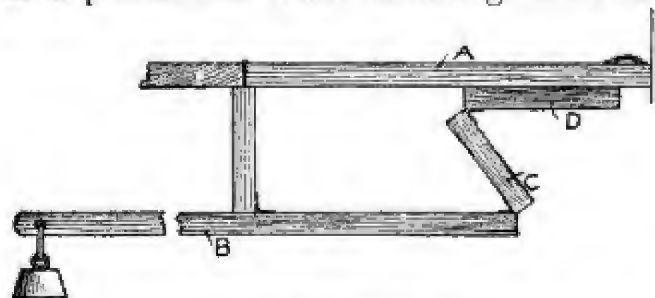
Parts of the Indicator

as it has an opening running through the metal from end to end and a set-screw by means of which it can be easily set at any point without knotting the rope.

In a soft-drink factory, where the indicating weight from the gas tank was in a dark corner, I was obliged to devise some means to show the bottler the condition of the contents. A device of light wood, Figs. 2 and 3, was constructed so that the arrow pointed to a portion of the wall where there was sufficient light to see a scale.—Contributed by James M. Kane, Doylestown, Pa.

Counterbalance for a Trapdoor

A heavy trapdoor opening up from the floor and out from a wall was used as a protection when standing erect in



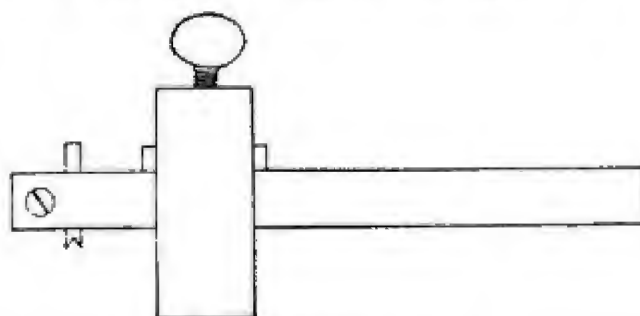
Counterbalance on Door

place of a railing. To keep the door, A, erect when open, an arrangement with a counterbalance had to be connected as shown in the sketch. A plank, B, was fastened with a hinge to the joist. The plank was cut in three

pieces, B, C and D. The piece D was fastened to the door and C, connecting both B and D with hinges. The plank may be any desired length, but the piece C must be as long as the width of the joist plus the thickness of the door. When open, the pieces of plank will form a perpendicular piece parallel with the erect position of the door. The weight must be regulated to counterbalance the door.—Contributed by T. F. Solon, Solon Springs, Wis.

Cutter for Inlaying Wood

An ordinary carpenter's gauge with a V-notch filed in the end of the marker, is useful for cutting small grooves for inlaid work. This device was adopted by the writer in working on drawer fronts of a sewing table. The inlaid strip was $\frac{1}{8}$ in. wide and $\frac{3}{8}$ in. from

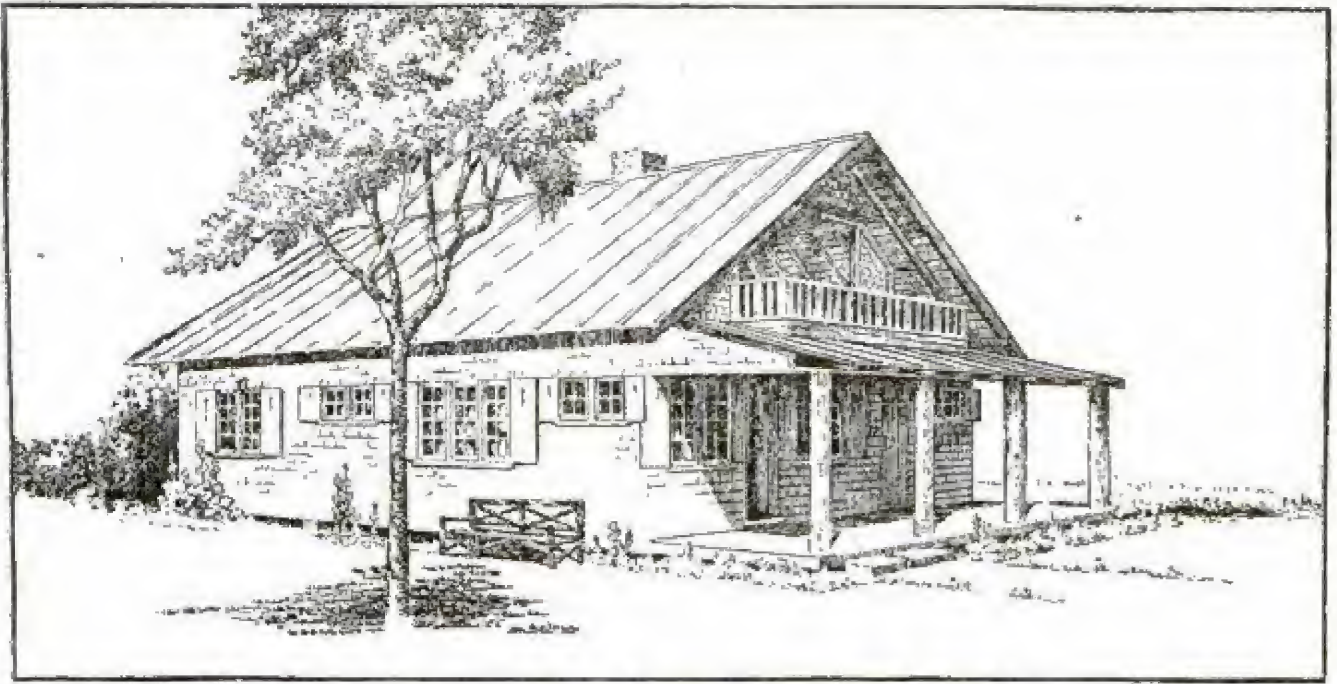


Cutter Made of Gauge

the edge all around. The marking gauge was supplied with a round steel wire having a notch cut in its end as shown. This gauged two lines $\frac{1}{8}$ in. apart and deep enough for the inlay. The stock between the two lines was removed with a narrow chisel made from a flat file.—Contributed by Joseph A. Shelly, Brooklyn, N. Y.

ⒸAn emergency pair of tweezers can be made by flattening the ends of a common hairpin.

ⒸWhen the revolving work in a lathe chatters so as to destroy the fineness of the cut, the trouble sometimes can be overcome by placing a wad of waste between the arm of the lathe dog and the side of the faceplate slot.



An Ideal Place for Summer Months That can be Built for \$700

An Inexpensive Summer Bungalow *

Summer-vacations have become such a factor in city life among all classes that there is a growing demand for inexpensive cottages, suitable for either seashore or mountains, and planned to meet the needs of a family during the hot days of the summer. The bungalow shown in the sketch is designed to meet this demand.

The problems to be solved in designing houses of this kind are so different from those usually encountered in the planning of city or suburban all-year dwellings that the work at once becomes stimulating, and one wonders why more attention has not been given to these "play houses."

As these dwellings are to be occupied for only a few weeks of the year, the most rigid economies must be observed in their construction, so that the first cost is not prohibitive and that the investment does not become a burden. The bungalow as shown is planned to be built of stock materials, such as can be purchased in any locality, and the simplest methods of construction are recommended. The exterior of the house is of wood, with rubberoid roofs, battened.

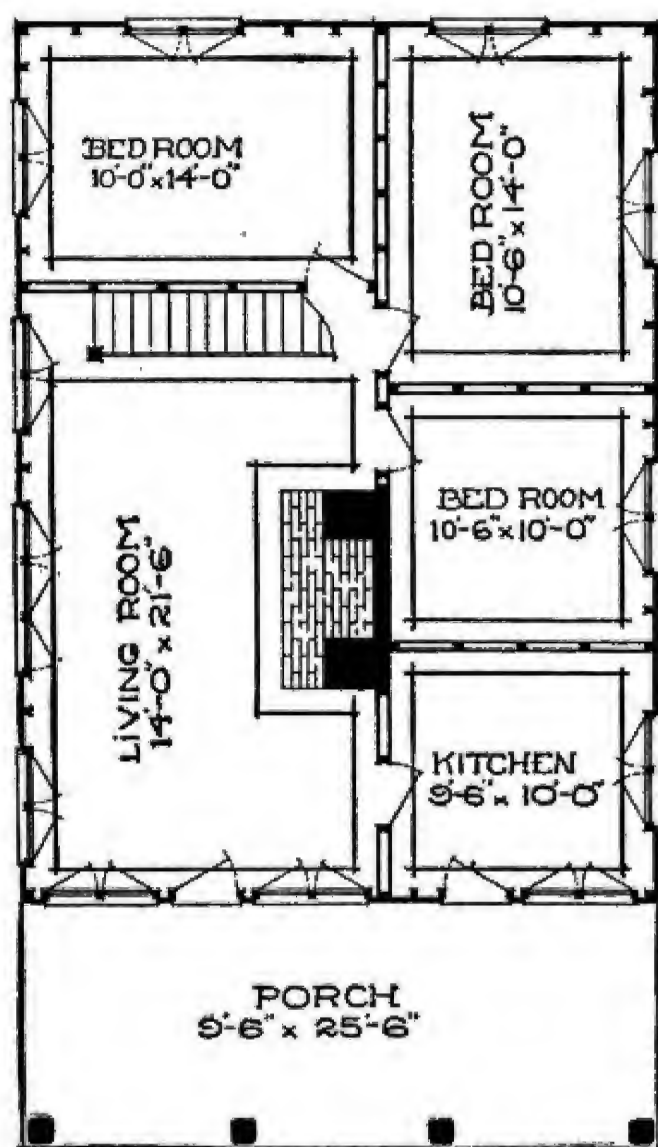
The plan for the house is shown without foundation. In selecting a site for this house, care should be taken to

secure a dry, well-drained surface, so that dampness will not rot the floor timbers, as the sills are to rest directly on posts sunk in the ground. A large, flat stone will form a good footing for the posts and will prevent the house from settling. Sawed shingles of either red or white cedar or cypress may be used for the exterior and may be left to weather. But for a few dollars, the owner can add much to the beauty as well as to the life of the cottage by applying creosote stains to the shingles, selecting harmonizing colors in grays, browns or greens to blend with the colors of the roofing and the surrounding landscape.

The walls are constructed of 3 by 4-in. dressed spruce or hemlock studs, placed about 5 ft. apart, and over this is nailed pine sheathing boards, with the dressed sides exposed in the rooms. The overhead beams are left exposed, with the floor above forming the ceiling. This panel construction of the side walls and ceiling becomes at once inexpensive, and yet very interesting. The interior being of wood, it lends itself to decoration in cool tones of gray or green stain.

An abundance of windows have been provided for light and ventilation. Casements are used, being the least

* From an article in *The Craftsman*



First-Floor Plan for Bungalow

expensive to install, as well as giving the added charm of windows which can

be thrown wide open. The wide entrance porch, with its balcony overhead, supported by hewn trees for posts, is most pleasing in effect. A living room, three bedrooms, and a kitchen are provided on the first floor. No bath is shown, because running water is seldom available, and these houses will generally be built in localities where bathing may be had in a lake or surf. If, however, the owner desires to go to that expense, another partition may be added and a bath placed between two of the bedrooms. The fireplace, built of stone or brick, laid up with wide, raked-out joints, will add to the rustic appearance of the interior and afford much comfort to those who have the leisure to spend a few weeks or months in these delightful places. A door opens directly from the kitchen to the porch, so that meals may be served in the open.

Ample storage room is provided in the attic by partitioning off the spaces under the eaves to a height of about 5 ft. Both ends of the attic are left entirely open, and this place will accommodate a number of cots and form most delightful sleeping quarters. Shutters should be provided for every window, as well as the open ends of the attic, so that the house may be securely closed during the winter months.

List of Materials

4 Spruce sills, 4 by 6 in. by 18 ft.			
2 Spruce sills, 4 by 6 in. by 14 ft.			
2 Spruce sills, 4 by 6 in. by 12 ft.			
All S-4-S (surface 4 sides).			
@\$30 per M.		\$ 7.44	
21 Chestnut posts, S-4-S, 6 by 6 in. by 5 ft.			
@\$1 each		21.00	
1 Spruce girder, 4 by 6 in. by 20 ft.			
1 Spruce girder, 4 by 6 in. by 9 ft.			
@\$30 per M.		1.74	
19 Spruce first-floor beams, 3 by 6 in. by 16 ft.			
19 Spruce first-floor beams, 3 by 6 in. by 12 ft.			
@\$30 per M.		23.94	
19 Spruce second-floor beams, S-4-S, 3 by 6 in. by 16 ft.			
19 Spruce second-floor beams, S-4-S, 3 by 6 in. by 12 ft.			
@\$33 per M.		26.33	
95 Spruce studs, S-4-S, 3 by 4 in. by 8 ft.			
30 Spruce studs, S-4-S, 3 by 4 in. by 4 ft.			
12 Spruce studs, S-4-S, 3 by 4 in. by 12 ft.			
@\$30 per M.		30.72	
32 Spruce rafters, S-4-S, 3 by 6 in. by 18 ft.			
@\$33 per M.		28.51	
10 Spruce porch rafters, S-4-S, 3 by 6 in. by 12 ft.			
@\$33 per M.		5.94	
2 Spruce plates, S-4-S, 4 by 6 in. by 20 ft.			
2 Spruce plates, S-4-S, 4 by 6 in. by 14 ft.			
2 Spruce plates, S-4-S, 4 by 6 in. by 12 ft.			
@\$33 per M.		\$ 07	
3 Spruce porch purlins, S-4-S, 4 by 6 in. by 10 ft.			
1 Spruce porch purlin, S-4-S, 4 by 6 in. by 18 ft.			
@\$33 per M.		3.16	
2 Spruce main-roof purlins, S-4-S, 4 by 6 in. by 10 ft.			
@\$33 per M.		1.32	
2 Spruce ridges, S-4-S, 2 by 10 in. by 18 ft.			
@\$35 per M.		2.10	
4 Porch columns: hewn chestnut logs, 12 by 12 in. by 8 ft.			
@\$1.50 each		6.00	
4 Spruce corner posts, S-4-S, 4 by 4 in. by 8 ft.			
@\$30 per M.		1.20	
11,000 White cedar shingles, 18 in. by random widths.			
@\$6.25 per M.		68.75	
2,100 Sq. ft. clear pine, T & G flooring, S-2-S, 3/4 by 4 1/2 in.			
@\$32.50 per M.		68.25	

3,350 Sq. ft. clear pine, T & G sheathing, S-1-S, for roof and sides, $\frac{3}{4}$ by 8 in.	
@ \$22.50 per M.	\$ 75.37
1,000 Sq. ft. pine partitions, T & G, S-1-S, $\frac{3}{4}$ by 8 in.	
@ \$22.50 per M.	36.00
600 Sq. ft. pine second-floor ceiling, T & G, $\frac{3}{4}$ by 4 $\frac{1}{2}$ in.	
@ \$32.50 per M.	19.50
19 Rolls of roofing.	
@ \$3.75	68.55
700 Lin. ft. spruce roof battens, S-4-S, $1\frac{1}{2}$ by 3 in.	
@ \$30 per M.	7.89
	<hr/>
	\$500.87

PORCH TIMBER

5 Spruce sills, 4 by 6 in. by 10 ft.	
1 Spruce sill, 4 by 6 in. by 18 ft.	
@ \$30 per M.	\$ 4.08
15 Floor beams, 2 by 6 in. by 9 ft.	
@ \$30 per M.	4.05
300 Sq. ft. pine flooring, T & G.	
@ \$32.50 per M.	9.75
5 Cypress fascia pieces, $\frac{3}{4}$ by 8 in. by 12 ft.	
@ \$4.80 per M.	1.92
60 Lin. ft. cypress quarter round, $\frac{3}{4}$ by $\frac{3}{4}$ in.	
@ 65 cts. per Hun. ....	.39

BALCONY RAIL

14 Balusters, $\frac{3}{4}$ by 6 in. by 2 $\frac{1}{2}$ ft.	
@ 10 cts. each	1.40
16 Balusters, $\frac{3}{4}$ by 3 in. by 2 $\frac{1}{2}$ ft.	
@ 8 cts. each	1.28
1 Bottom rail, $1\frac{1}{4}$ by 10 in. by 12 ft.	
1 Bottom rail, $1\frac{1}{4}$ by 10 in. by 16 ft.	
@ 6 $\frac{1}{2}$ cts. per ft.	1.82
1 Top rail, $1\frac{1}{4}$ by 6 in. by 12 ft.	
1 Top rail, $1\frac{1}{4}$ by 6 in. by 16 ft.	
@ 3 $\frac{1}{2}$ cts. per ft. ....	.98
115 Lin. ft. $\frac{1}{2}$ in. quarter round.	
@ 50 cts. per Hun. ....	.58

STAIRS—PINE

13 Risers, $\frac{3}{4}$ by 7 $\frac{1}{2}$ in. by 2 $\frac{1}{2}$ ft.	
@ 40 cts. per M. ....	.88
12 Treads, $1\frac{1}{4}$ by 10 in. by 2 $\frac{1}{2}$ ft.	
@ 45 cts. per M.	1.44
2 Strings, $1\frac{1}{4}$ by 12 in. by 16 ft.	
@ 50 cts. per M.	2.00
3 Newel posts, 5 $\frac{1}{2}$ by 5 $\frac{1}{2}$ in. by 4 ft.	
@ \$1.75 each	5.25
1 Top rail, 16 ft.	
@ 5 cts. per ft. ....	.80
1 Bottom rail.	
@ 5 cts. per ft. ....	.80
24 Balusters, $1\frac{1}{4}$ by $1\frac{1}{4}$ in. by 2 $\frac{1}{2}$ ft.	
@ 10 cts. each	2.40
4 Second-floor rails, $\frac{3}{4}$ by 6 in. by 14 ft.	
@ 4 cts. per ft.	2.24

INSIDE BATTEN DOORS

4 Pine, T & G, V-jointed, 2 ft. 6 in. by 7 ft. 4 in., $\frac{3}{4}$ in.	
@ \$2.65 each	10.60
4 Pine, T & G, V-jointed, 2 ft. 6 in. by 4 ft. 4 in., $\frac{3}{4}$ in.	
@ \$1.50 each	6.00

OUTSIDE BATTEN DOORS

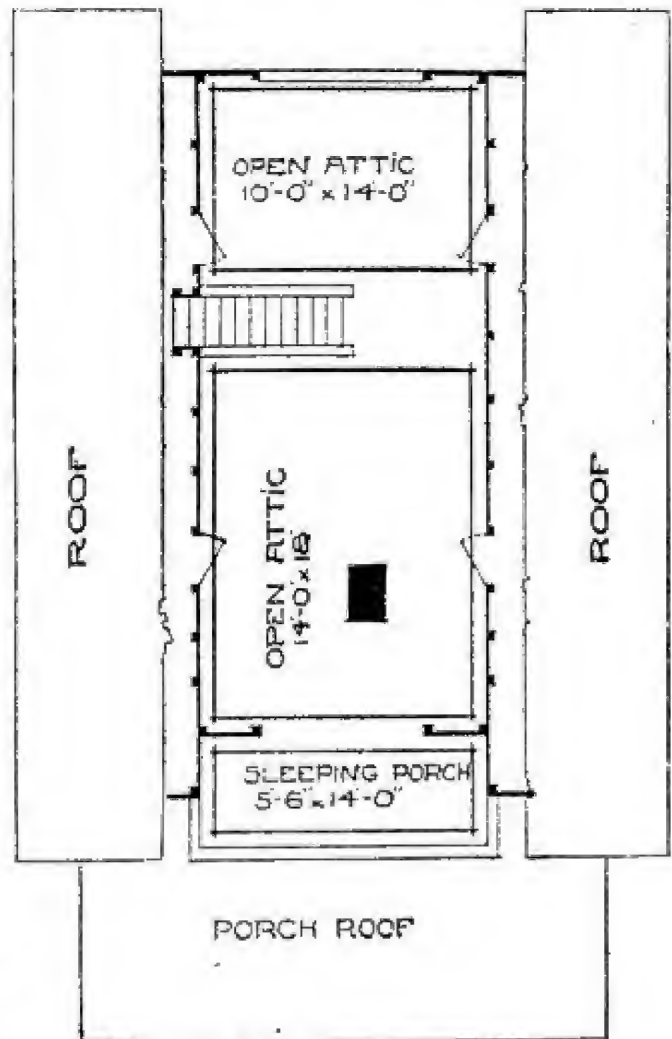
4 Pine, T & G, V-jointed, 2 ft. 6 in. by 7 ft., $1\frac{1}{4}$ in.	
@ \$3.60 each	14.40

DOOR STOPS

20 Pieces, $\frac{1}{2}$ by 2 in. by 7 ft.	
10 Pieces, $\frac{1}{2}$ by 2 in. by 2 ft. 8 in.	

WINDOW STOPS

50 Pieces, $\frac{1}{2}$ by 2 in. by 4 ft. 8 in.	
25 Pieces, $\frac{1}{2}$ by 2 in. by 2 ft. 1 in.	
All @ 1 $\frac{1}{4}$ cts. per ft.	5.87
225 Cu. ft. brick.	
@ 15 cts. per cu. ft.	50.25
10 Sash, 2 ft. by 4 ft. 6 in. by $1\frac{1}{2}$ in., 8 lights.	
@ \$1.70 each	32.30



Second-Floor Plan

6 Sash, 2 ft. by 2 ft. 3 in. by $1\frac{1}{2}$ in., 4 lights.	
@ 90 cts.	\$ 5.40

HARDWARE

25 Pairs, 3 by 3-in. sash hinges.	
@ \$1.20 doz.	2.50
2 Pairs, 4 by 4-in. door hinges.	
@ \$1.44 doz. ....	.24
8 Pairs, 3 $\frac{1}{2}$ by 3 $\frac{1}{2}$ door hinges.	
@ \$1.20 doz. ....	.80
8 Pairs thumb latches.	
@ 69 cts. doz. ....	.46
2 Pairs rim locks for outside doors.	
@ \$2.00 doz. ....	.33

\$171.21

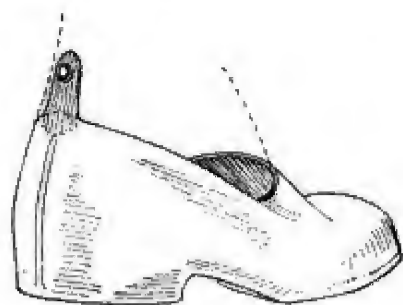
500.87

\$681.09

According to the Mechanical World, 4 parts of alabaster plaster and 1 part of finely pulverized gum arabic, mixed with a cold saturated borax solution into a thick paste, make an unequalled all-around cement for stone, glass, bone, horn, porcelain and wood, which becomes hard as marble and possesses the agreeable working quality of not solidifying immediately, but in 24 to 30 hours.

Attaching Rubbers to Shoes

After wearing rubbers a few times, they will become a little larger and fit

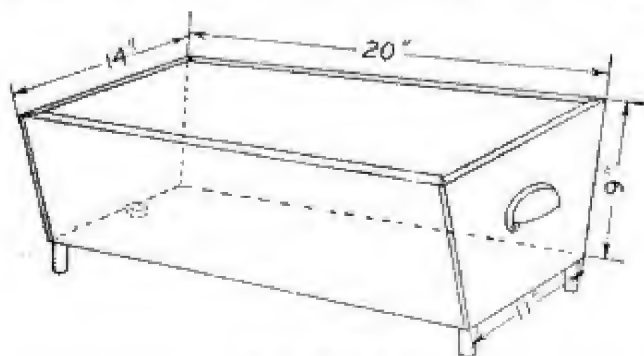


loosely over the shoes. Sometimes the looseness is quite annoying and when walking in

slush and muddy paths it is almost impossible to keep the rubbers on. This trouble I prevented by attaching the tongue and button as shown in the sketch. A tongue is fastened to the upper part of the back on each rubber and a button sewed on the back of each shoe. The tongue has a hole for the button.—Contributed by C. Homewood, Waterloo, Iowa.

A Washtub for Use in a Sink

The average woman finds the filling and emptying of washtubs quite a task. Even when the washing is sent out, some fine pieces of clothing and flannels are always laundered at home because they are not to be trusted to a laundress or laundry. A tub that can be set in a sink and used in connection with a small washboard, costing 15 cents, and a cheap wringer, will enable any woman to do a small washing



Sink Washtub

without bending, or emptying or lifting the water or tub.

A carpenter can furnish the material and make such a tub for a nominal price. The handles for the ends, and

the feet can be put on at home. A coat of paint may be applied to the outside if one cares for appearance. For the average sized sink the following dimensions will be found correct. It is better to measure the sink before making the tub. Pine wood is used for the material and should be $\frac{3}{4}$ or 1 in. thick. The height of the tub is 9 in. The sides are straight pieces of wood and measure 9 by 20 in. The two ends are 9 by 14 in., and the bottom is 11 by 19 in.

The two ends are rabbeted to receive the sides and bottom. Coat the rabbeted parts with white lead before nailing them together. A drain hole is bored in the bottom of the tub and a cork used instead of a wood plug. The cork swells with the water, but can be renewed when worn out. Feet are attached to keep the tub from resting on the bottom of the sink. This adds to the height of the tub and allows a free passage for the waste water. The feet can be made of pieces $1\frac{1}{2}$ in. in length, cut from a broom handle. The handles for the ends of the tub are the kind that are used on kitchen cupboard drawers.—Contributed by Katharine D. Morse, Sycamore, N. Y.

Soldering a Hole on an Overhead Surface

The mechanic as well as the owner of an automobile does not care to take off the body in order to remove the gasoline tank to solder a leaking rivet in the bottom. During an attempt made by the writer to effect such a repair, it was found that while the metal and rivet became well tinned, the solder would run back on the iron and the leak could not be stopped. The following method eventually proved successful:

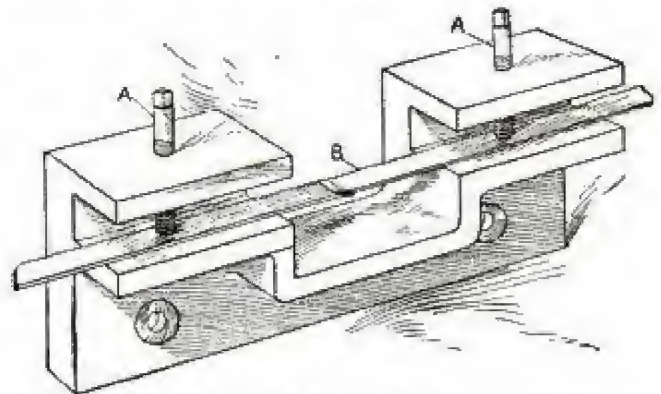
A small tin cap of sufficient diameter and depth to cover the rivet head was first filled with solder and then held in place with the hot iron. After the solder was thoroughly melted, the cap was held in place with the point of a file until the solder cooled. A permanent repair was made in this manner.—Contributed by Fred C. Inghram, Tucson, Ariz.

Brazing Broken Band Saws

The factory or mill using band saws in any quantity must be provided with tools for filing and repairing them when they become dull or broken. For those who have only one saw the repair tools cannot be so elaborate. In this case, such a tool as shown in the sketch is not expensive and will be of great assistance in joining the ends of a broken saw blade. It is made of cast iron with the channel planed out perfectly straight. The channel provides a shelf for the saw to lie on and a place on each side of the gap for a setscrew to hold down the saw to the shelf. The saw can be clamped flat with its back against the rear of the casting while brazing, thus keeping the alinement perfect.

The two ends of the saw should be beveled and a piece of silver solder slipped between them. The joint should be made in the middle of the gap. A flame from a blow torch can be turned on the joint, and as soon as the solder has fused thoroughly, a clamp should be applied. On cooling,

this will make a thin, tight joint. If many saws are to be brazed, fit the jaws of a pair of tongs with pieces of



Broken Saw in Holder

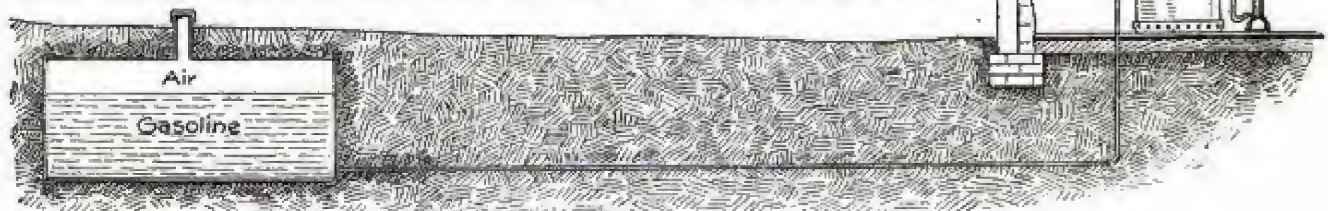
steel, each about $\frac{1}{2}$ in. thick by 1 in. square. These false jaws retain the heat well and can be heated in any blacksmith's forge or with a blow torch. The grip of the hands on the tongs will be a sufficient clamp. Ordinary brazing spelter can be used, but it is lumpy for small work and does not flow as readily as the silver solder. Use borax as a flux in either case.—Contributed by Donald A. Hampson, Middletown, New York.

Filling Container from Gasoline Storage Tank by Air Pressure

The light used in my plant consumed gas made in the ordinary way under air pressure from gasoline. The container is a 10-gal. tank with the necessary valves, air gauge and air pump attached. This had to be filled every evening, and it was quite a job to carry gasoline from the large storage tank, besides causing some waste. To do away with this, I changed the arrange-

the container with a $\frac{3}{8}$ -in. pipe, as shown in the illustration. About 40 lb. of air pressure is necessary on the gasoline when the outfit is in operation.

To fill the container, I



Filling Gasoline Container without Waste

ment of the tanks by burying the 110-gal. storage tank in the ground, 50 ft. from the building and connecting it to

simply open the valve B and let the air pass into the storage tank until the pressure is equalized in both tanks.

The air gauge A will show from 10 to 15 lb., owing to the amount of air space in the storage tank, when the pressure is equal. The plug C is then removed to let the air out of the container. The air pressure in the storage tank will

force the gasoline through the pipe, thus filling the container without waste. The flow of the gasoline can be watched through the hole where the plug C was removed.—Contributed by C. S. Enright, Cle Elum, Wash.

How to Fit Door Locks

Many beginners at carpentry approach the work of putting in a mortise lock with considerable doubt as to their ability of successfully accomplishing the task, and many others who have worked at the trade for years have no regular rule whereby they may do the

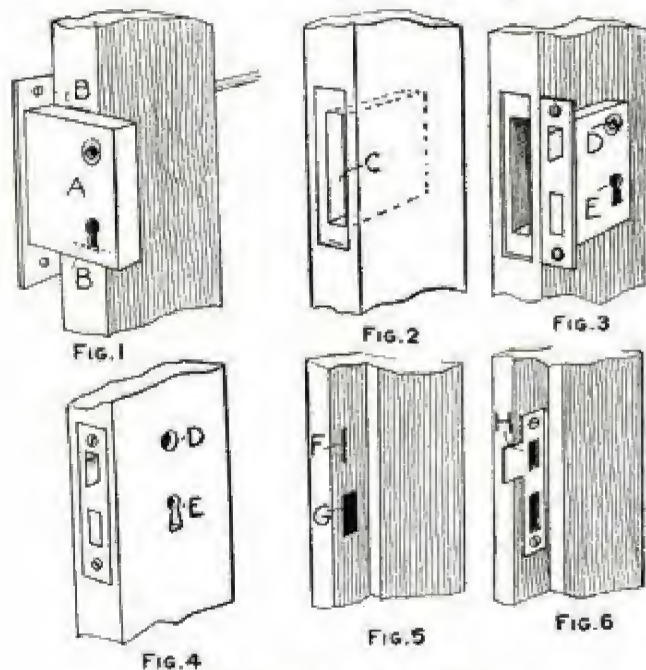


FIG. 1
FIG. 2
FIG. 3
FIG. 4
FIG. 5
FIG. 6
Different Stages in Lock Fitting

work quickly and accurately. The tools necessary to do the work are, a screwdriver; a brace with two bits, one $\frac{3}{8}$ -in. and one $\frac{3}{4}$ -in.; two chisels, one $\frac{3}{8}$ -in. and one $\frac{3}{4}$ -in.; a scratch awl; a pocket knife; and a marking gauge. A $\frac{1}{2}$ -in. chisel can be used to advantage, but is not necessary.

When putting in mortise locks, two things must be taken into consideration; first, the height from the floor that will make the knob easy to grasp and, second, the place where it may be let into the stile without doing harm to the strength of the door. The distance from the floor to the knob should be from 32 to 36 in., as this is a location easily reached by both children

and adults. Sometimes the tenon on the end of a cross rail will be at this height and the lock, if possible, should be placed either above or below it. If placed in a tenon, it not only weakens the door, but it is difficult to properly clean out the mortise. All doors on the same floor in a house are generally of the same design and the location of the locks will be the same on all doors.

When the location of the lock is found, lay the lock across the edge of the door, as shown in Fig. 1, with the back of the faceplate against the side of the door, and scratch the short lines at the top and bottom with the awl as shown at BB. After setting the gauge to half the thickness of the door, mark a center line from B to B. Bore a hole at B and B with the $\frac{3}{4}$ -in. bit so they will extend a little outside of each mark and to a depth of $\frac{1}{4}$ in. more than the depth of the lock, measuring from the faceplate. Bore as many holes between the two as will be necessary to remove the wood in the mortise. Be careful to bore the holes exactly parallel with the surfaces of the door stile. It is a good plan to file a notch in the bit for a depth gauge to prevent boring too deep.

When the holes are bored, take the large chisel and smooth the sides of the mortise and square the top and bottom with the narrow chisel. Slip the lock into the mortise until the back of the faceplate lies closely against the edge of the door and shows the same margin of wood on each side. Hold it firmly in place and mark along the top, bottom, and both sides of the faceplate with the point of the knife blade, Fig. 2. Remove the lock from the mortise and lay it along the side of the stile as shown in Fig. 3 and mark the location

of the spindle hole D and the inside shape of the keyhole E with the awl. Bore the hole D with the $\frac{3}{4}$ -in. bit and the round hole E with the small bit and cut out the lower part of the keyhole with the knife blade. Should the door be of oak or other hard wood, a keyhole saw should be used instead of the knife. Deepen the cuts made around the faceplate with the knife blade and chisel the wood out around the mortise to a depth equal to the thickness of the faceplate. Insert the lock and fasten it with screws as shown in Fig. 4.

Many mechanics make difficult work of setting the keeper, yet it is the easiest part of lock fitting. When the lock is in place, insert the key and turn out the bolt while the door is open. Take some colored chalk and make it damp, or any other material that will adhere to the metal, and place a little on the face of the bolt and end of the knob latch, after it is turned out the full throw of the knob. Turn them both back and carefully close the door. Release the knob and turn out the key bolt. Turn them back again and open the door and you will find markings on the rabbet of the door frame as shown at F and G, Fig. 5.

Lay the keeper over the impressions on the rabbet and set it so as to have the same margin between the impressions and the holes in the keeper plate top and bottom and allow $\frac{1}{32}$ in. between the upper impression and the front side of the hole in the keeper, as shown at H, Fig. 6. Hold the plate firmly in place and mark all around the outside with the point of the knife blade. Remove the plate and chisel out the wood inside of the knife marks to a depth equal to the thickness of the keeper plate. This is to make it flush with the face of the rabbet. Fasten the plate in place with screws taking care to turn the screws in at right angles with the surface of the work. The screw heads will be level with the surface of the plate, if this caution is observed.

Cut out the mortises in the wood through the holes of the keeper, using the narrow chisel. Make them deep enough to receive the latch and key bolt when they are entirely extended. If these simple instructions are carried out, each lock will work perfectly and the workman need not waste the time measuring for the different parts as in the usual methods.—Contributed by Ed. A. Peacock, Cincinnati, O.

Welding Steel without Compounds

One day I had several auger bits to lengthen and though I was short on welding compound at that time, I completed the work in the following manner:

I used $\frac{1}{2}$ and $\frac{5}{8}$ -in. round iron to weld on the augers to make the length desired. I scarfed them in the ordinary way, then I heated the iron very soft and the steel only a little more than cherry red and used a little sand as a flux. I found that the weld was much better when I put the steel on the iron and hammered it rather light at first, then finishing with harder blows. All of the parts were joined perfectly and I did not miss one heat.—Contributed by Wm. Skoglund, Brooklyn, N. Y.

Making Clearance on a Twist Drill

A twist drill that has the clearance worn off can be repaired as shown in the illustration. Lay the drill flat on



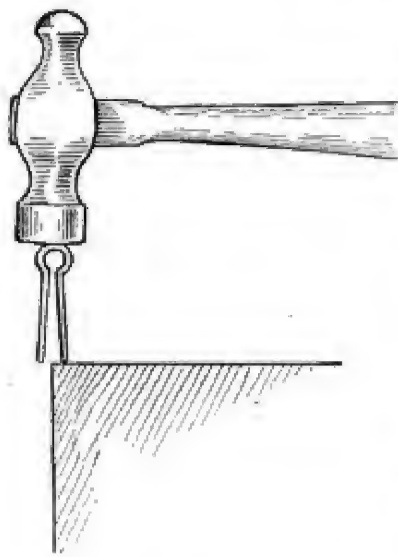
Drive Out the Point

an anvil and strike the cutting edge on the place marked A and grind it in the usual way. An old drill treated this way will work as good as new.—Contributed by Julius Fast, Milwaukee, Wisconsin.

Wet the surface of glass and the diamond or cutter will cut better.

Closing a Split Cotter Pin

A split cotter pin after being opened requires a little "persuasion" to close it again.

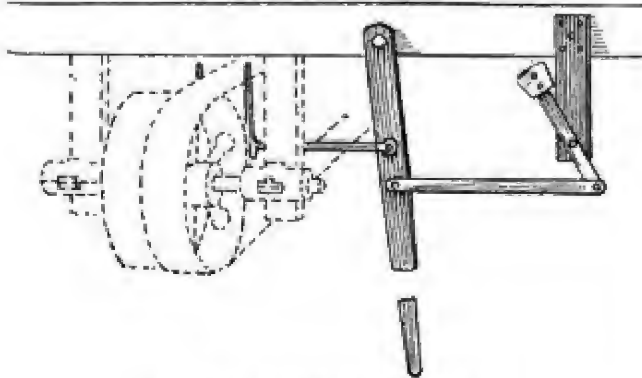


The quickest and most satisfactory way to accomplish this is to place one leg of the pin on an iron block or the jaw of a vise and gently strike the head with a hammer. This

causes the legs to come together the same as a new pin.—Contributed by A. H. Burton, Chicago.

Weight on a Belt Shifter

The constant jar of a countershaft gradually works the shifter handle over until it hangs almost perpendicular, then the belt is half off and half on the driving pulley. The sketch shows an attachment for the shifter handle that will keep the belt on the tight or loose pulley as the occasion demands. When the weight is shifted to either side of the center, it has a tendency to keep the belt over in the op-



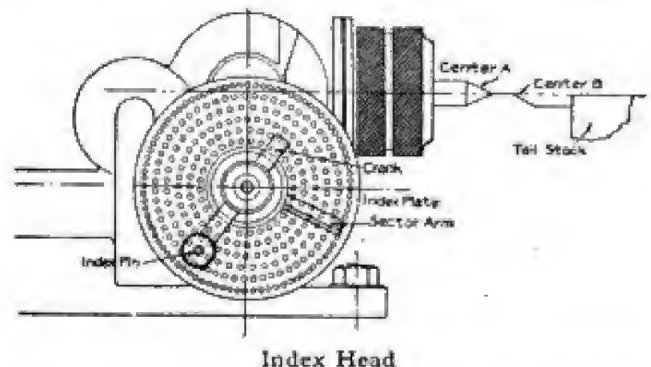
Weight Keeps Belt in Place

posite direction from its position by the jar of the machinery.—Contributed by C. Mike Graham, Oskaloosa, Iowa.

Cutting a Gear on a Milling Machine

The teeth on a gear can be cut with accuracy on the milling machine by using an index head as shown in the sketch. A blank, which has been previously turned up to the proper diameter, is placed on the centers A and B. The machine table is raised so that the cutter just touches the face in the center on the blank gear. Then move the table away from the work, but do not lower it. This will leave the cutter on a level with the face of the blank gear. The depth of the cut is now set by the dial on the milling machine proper. One revolution of this dial will raise the table $\frac{1}{8}$ in. The depth of the cut can be set accurately.

The gear blank being set for the proper depth of cut, the next step to take is to make the proper space from one tooth to another. This is accom-



plished by the index head as shown. Take for example, a blank gear that is to have 45 teeth. Almost all index heads have a plate with a circle containing 90 holes. The sketch shows an index plate with 90 holes in the outside circle. To cut 45 teeth on a blank, set the crank so that the index pin will enter a hole in the 90-hole circle.

Assuming that the ratio between the center A and the crank is 40:1 which means that 40 revolutions of the crank revolves center A one turn, then $\frac{1}{45}$ of a revolution of the center A requires $\frac{40}{45}$ of a revolution of the crank. The pin therefore must be moved $\frac{40}{45}$ of 90 or 80 holes for each cut.

Another way which may be a little clearer, is to take the number of teeth on the worm wheel of the head, which is generally 40, for the numerator and

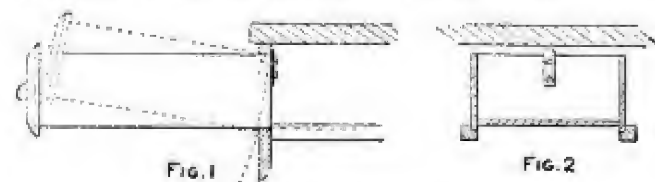
the number of teeth to be cut for the denominator of the fraction. Example: Suppose 30 teeth are to be cut in a blank gear, then the fraction would be $40/30$ or $1\ 10/30$, which would mean that the crank must be set so the index pin would enter holes in the 30-hole circle. The setting for each cut would require one complete revolution of the crank and 10 holes more.

If the index head does not have a circle of 30 holes, then the crank must be set on the 90-hole circle. In this case, the fraction, both numerator and denominator, must be multiplied by 3, which gives $1\ 30/90$. The crank must be turned one complete revolution and 30 holes more, when using the 90-hole circle.

In using the index head on a milling machine, just as good work, and sometimes better work, can be done than on a regular gear cutter.—Contributed by Harold E. Murphy, Pawtucket, R. I.

A Stop for a Drawer

A simple yet practical method to prevent pulling drawers out too far and spilling the contents is shown in the sketch, Fig. 1. A piece of steel about $\frac{1}{16}$ in. thick, $\frac{3}{4}$ in. wide and 3 in. long is drilled and attached by two screws to the back of the drawer (Fig. 2) so as to project about $\frac{1}{2}$ in. above the top edge. The drawer may be removed to screw on the piece and then inserted by slightly tilting the same



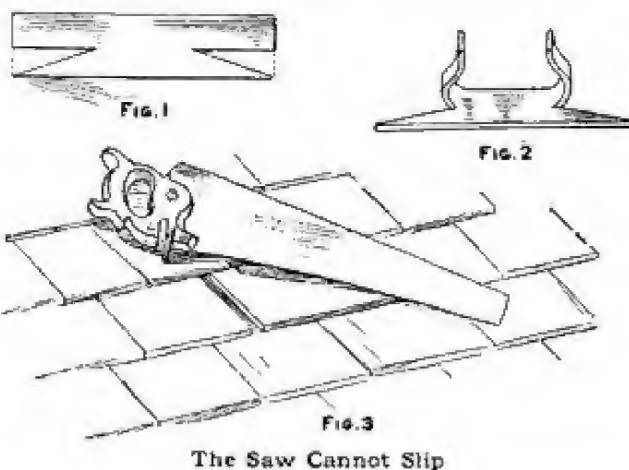
Stop on Drawer Back

upward, as shown in Fig. 1. The drawer is removed for cleaning in the same manner.—Contributed by Otto J. Kling, Youngstown, O.

Can an internal combustion engine run with the water jacket so hot that you cannot hold your hand on it uses less fuel than it would if the jacket were kept cold.

Preventing a Saw from Sliding on Sloped Surfaces

A saw laid on the sloping surface of a roof or on a scaffold is apt to slip and



The Saw Cannot Slip

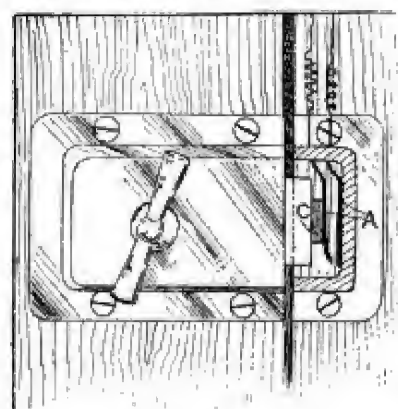
fall if slightly jarred. The sketch shows the construction of a small device I made to fit over the back of a saw handle to hold the saw wherever it is placed. It consists of a piece of sheet metal cut as shown in Fig. 1 and shaped as in Fig. 2. When slipped over the handle a point projects on each side as in Fig. 3. A saw cannot slip with this device attached.—Contributed by C. C. Brabant, Alpena, Mich.

Repairing Umbrellas

Umbrellas may be repaired with no other tools than a pair of pliers, a knife and a needle. No supplies are needed except some thread and a piece of small wire. The operation is too simple to require a description and about the only thing to look out for is to see that a whole rib is put into the place where a broken one was removed. The writer was surprised to find it so easy to make a repair, and, having begun at this work, it was found that there were enough broken umbrellas in the house to supply each member of the family with two good ones after they were mended. If a cover is needed, it may be that one can be taken from an umbrella that is used to supply the ribs for the others.—Contributed by Frank W. Blake, North Adams, Mass.

Electric Connection for a Door Latch

A door latch equipped with an electric connection for "switching on" a



light is shown in the sketch herewith. The connection is for use on toilet and bathroom doors. When closing the door after entering the

room the latch turns on the light. The socket part is fitted with two contact springs, A, which are the terminals of an electric-light circuit. A small block of wood or insulating material is fastened to the spring as shown, to prevent a shock when turning the handle. The two ends should be well insulated where they enter the lock. The light burns only when the door is secured by the latch.—Contributed by F. G. Christensen, Santa Rosa, Cal.

Balance for Measuring Liquids Automatically

When any liquid is poured into an opaque container, it is difficult to determine the depth of the material until it overflows the mouth. To save time and avoid waste, a simple balance will give warning by tilting when the vessel is almost full.

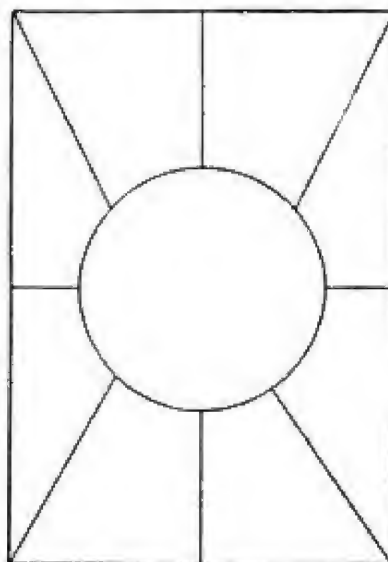
Such a balance can be made of a piece of board, 1 or 2 ft. long, with a triangular strip of hardwood fastened with nails across the under side. Place the can or other vessel on one end and a weight on the other and adjust the balance by moving either fulcrum or weight until the full can just tips it. A strip of wood should be nailed across the end of the board to set the can against so that it will always be placed the same distance from the fulcrum. After adjusting, fasten the weight securely.

This simple apparatus is especially convenient for use in filling gasoline

torches, stove reservoirs, etc. Those having occasion to do this know how slowly the gasoline passes through the strainer unless the funnel is kept well filled, and how carefully the liquid must be poured toward the last, else there is waste. It is particularly applicable to this use because gasoline is generally handled by artificial light, and a fair amount of daylight by which to watch the process of filling is not always available.

Cutting Steam-Gauge Glasses

When cutting a circular piece of glass for a steam gauge, many me-

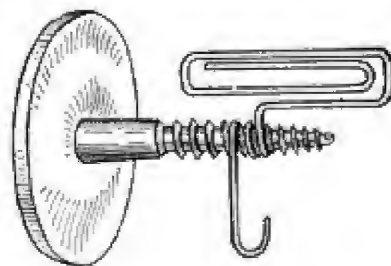


chanics spoil piece after piece in getting the circular section. Radiating cuts to the edge of the stock, as shown in the sketch, will enable one to break away the unnecessary

parts without danger of breaking the circular portion.—Contributed by F. W. Bentley, Jr., Huron, S. Dak.

A Vacuum Sticker

A handy vacuum sticker can be easily made from a round, red rubber taken from the porcelain stopper of a beverage bottle, a screw and a short piece of brass wire.

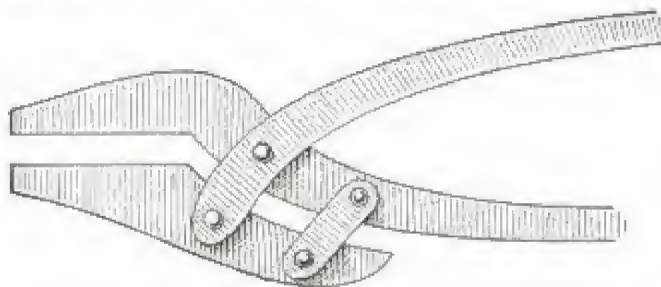


The screw must be of the right size to tightly fit the hole in the rubber. After the screw is pushed through the hole,

the wire is wound on the threads as shown in the sketch. The upper part may be used to hold cards by pushing the edge of the card between the two wire loops. The hook may be used to hold light articles. The sticker is to be used on any non-porous and smooth surface and is applied by first putting some water or glycerine on the rubber, then pressing it against the surface so that the air is expelled. This sticker will hold 3 lb.—Contributed by Abner B. Shaw, N. Dartmouth, Mass.

Blacksmith's Parallel Tongs

The ordinary blacksmith's tongs are not constructed so they will grip pieces of various thicknesses and hold



Parallel Jaws

them solidly. The jaws are set so that when opened they will be parallel only at a certain point of separation, thus making it necessary to have a number of tongs about the anvil. The illustration shows a way to make parallel jaws on tongs for holding pieces of various thicknesses. When holding with these tongs, the material held will not turn sideways or slip away from the grip of the jaws.—Contributed by Geo. Newfeld, Philadelphia, Pa.

Repairing a Broken Valve Stem

It is often necessary, because a new valve cannot be obtained immediately, to make a repair on a broken valve stem. The following is a method of repair that will make the old stem as good as a new one. The first operation is to dovetail the end of the broken stem, as shown in Fig. 1. Take a piece of round rod the same size as the stem and cut the end to fit in the

dovetail. Place them together, as shown in Fig. 2, and heat the joint to a bright red, being careful not to burn

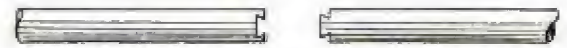


FIG. 1

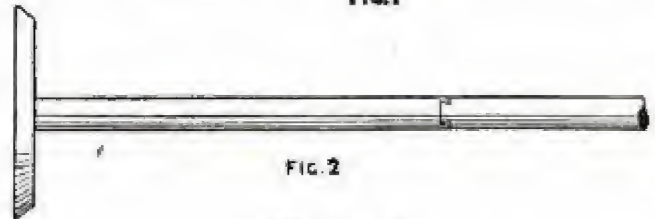


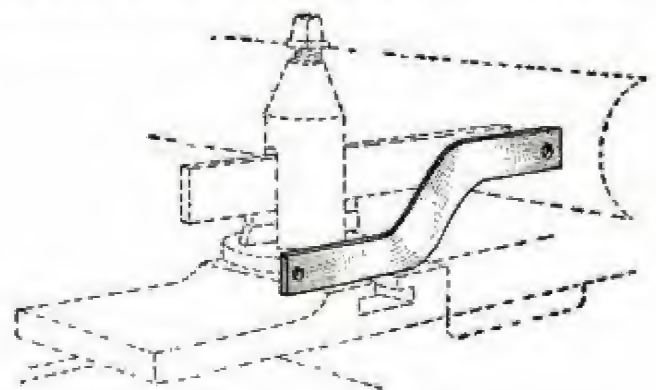
FIG. 2

Joint in Stem

the metal. Cover the parts with borax, and just as soon as it flows, apply spelter. Leave it in the fire until the metal shows a dull red, then remove and allow it to cool. Clean and polish the rod to make it move freely in the guide. Cut to the right length, and the stem will serve as well as a new one.—Contributed by J. N. Bagley, Webber, Kansas.

Setting a Lathe Tool

Much time may be saved in setting the cutting tool in a lathe, by using the simple little device shown in the accompanying illustration. It is made of sheet metal and the holes are drilled in the ends for convenience in hanging it up. The vertical distance between the extreme top and bottom edges is equal to that between the flat surface of the lathe carriage and the point of either of the lathe centers. In use, the device is placed as shown and the lathe



Gauge for Tool Setting

tool is adjusted until its top edge corresponds with that of the device.—Contributed by Joe V. Romig, Allentown, Pennsylvania.

Ladder Fastener

Ladders that are used in a loft, hay mow or similar places where they must be set at such a slant that slipping is liable to occur, should be provided with some kind of a fastener or grip. Such a fastener is shown in the accompanying sketch. It is made of a piece of $\frac{1}{4}$ by $\frac{3}{4}$ -in. iron, bent as shown and attached with two $\frac{1}{4}$ by $1\frac{1}{2}$ -in. wood screws. One of these fastened on the upper end of each support insures the ladder against slipping.

If the lower ends are sharpened a little, they will dig into the floor where there is no recess just back of the beam.—Contributed by Donald A. Hampson, Middletown, N. Y.

Plowshare Tongs

When holding a plowshare for sharpening, some kind of tongs that will stick and at the same time be light and short so that one will have the weight of the share close to the hand are necessary. To get a good grip with ordinary tongs they must have long handles and then the smith must take hold out near the end. This places the weight of the share so far from the hand that it is difficult to manage, and then the share will slip



Three-Point Contact on Jaws

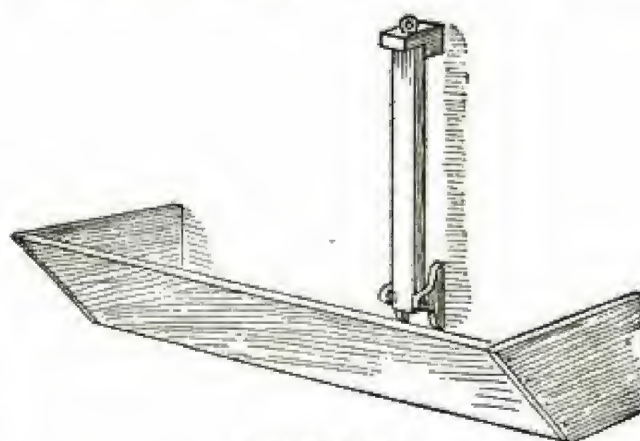
and turn where it is not wanted, says a correspondent of the Blacksmith and Wheelwright.

The sketch shows the construction of special plowshare tongs. The entire length from tip to tip is 12 in. The distance between the fulcrum and the load is reduced to the least possible. Each jaw has three raised points, the face of the lower shown in the sketch at A and the upper at B. These points working on the same principle as a stool having three legs, all points will touch the surface with equal weight or pressure. It will be seen that the points are reversed on each jaw; where there is one point on the lower jaw, there are two on the upper, and vice versa. This fulcrum applies great leverage in a short radius and the points give great gripping power.

The tongs shown first in the sketch are for a certain thickness of metal and the last shown are adjustable for various purposes.

Holding Food for Stock

Fodder, such as cornstalks that are not shredded, is frequently tossed out



Fodder Clamp

of the manger and wasted. A device for holding this kind of feed against the wall in front of the manger is shown in the sketch. It is made of 2 by 4 in. material, about 3 ft. long, hinged at the lower end and clamped at the top. The stalks are placed behind the upright piece and securely clamped. Several of these devices placed at intervals along the manger will make it hard for the stock to pull the fodder out and waste it.—Contributed by Henry Weber, Sr., Friend, Neb.

Home-Made Moisture Gauge for Incubators

An incubator hygrometer that will give fairly accurate results can be made by fastening two thermometers and a small bottle to a wood back as shown in the sketch. The back should be from $\frac{1}{4}$ to $\frac{1}{2}$ in. thick, as wide as the opening into the egg chamber will allow—usually about $3\frac{3}{4}$ in.—and long enough to hold the articles mentioned. Two holes $\frac{1}{2}$ in. in diameter and $\frac{1}{8}$ in. deep are bored to form bulb sockets. A place is hollowed out for the bottle and grooves cut along the upper edge of the thermometers to accommodate their turned-down edges. The general appearance of the instrument will be greatly enhanced if the back is stained or painted.

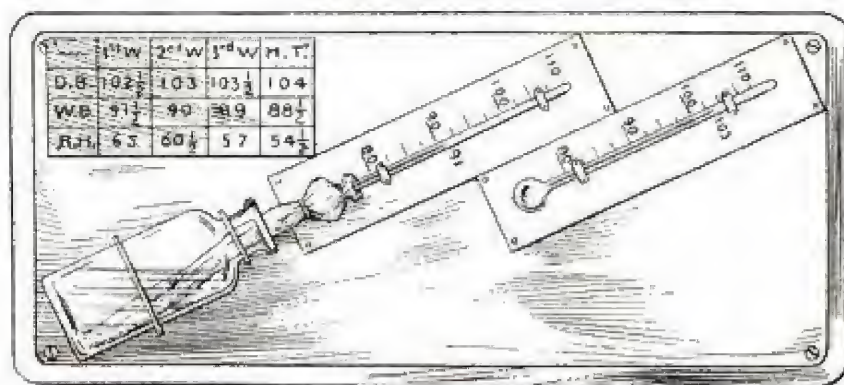
The two thermometers should be of the same make or at least should register within $\frac{1}{2}$ deg. of each other. The bulbs should be as close together as possible and the center of each exactly the same height, $1\frac{5}{8}$ in. above the bottom of the tray when the gauge is in position. If the tray is slatted, the thickness of the slats must be taken into consideration. The thermometers are fastened with brass-headed tacks put through small holes drilled in the metal back.

The bottle should be flat and hold from $\frac{1}{2}$ to 1 oz. It must be placed as low as possible. The mouth must be slightly lower than the bulb and about $\frac{3}{8}$ in. from it. The wick can be made of old muslin, wide enough at one end to encircle the bulb. A width of $\frac{3}{4}$ in. is sufficient for the remainder. The muslin is tied above and below the bulb with a thread.

Use distilled water or rain water in the bottle, as ordinary well water will soon clog the wick, thus giving inaccurate readings. In use, the hygrometer stands on edge among the eggs about where the thermometer is usually placed. The temperature is indicated

by the dry bulb, the percentage of moisture by the difference between the two. If the relative humidity runs above 85 or below 25, no chicks need be expected.

To secure the best results, the rela-



Moisture Gauge and Table

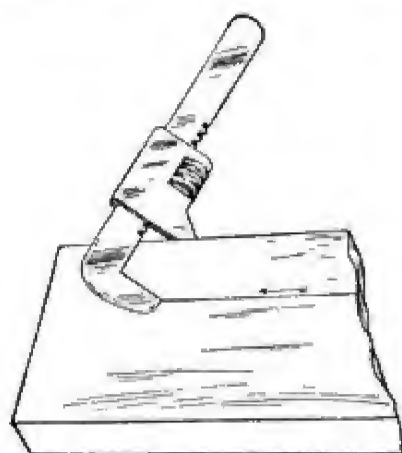
tive humidity should be about 65 when the eggs are put into the machine, and gradually reduced to about 55 by hatching time. To accomplish this, hold the gauge to the table on the base of the gauge shown in the sketch.

A variation of 1 deg. by the wet bulb when the dry bulb remains constant, indicates a difference of about $2\frac{1}{2}$ per cent in amount of moisture. If too wet, give the egg chamber more ventilation. Should the wet bulb range several degrees too high and cannot be lowered sufficiently by the ventilation, then the room where the incubator is placed is probably too damp. The presence of mold will prove this. Air out thoroughly and use some air-slaked lime. In extreme cases, a small chunk of lime may be put in a pan or on a board and set inside the incubator until the humidity falls to the proper degree. If all remedies fail, move the machine to a dryer location. Humidity, like temperature, should be right before eggs are put into the incubator. After that, it is easily controlled.—Contributed by B. Orlando Taylor, Bosworth, Mo.

♣ Mats for flower pots can be cut from the sides of worn-out hot-water bags.

An Emergency Marking Gauge

Having lost or misplaced my marking gauge I used a monkey wrench in

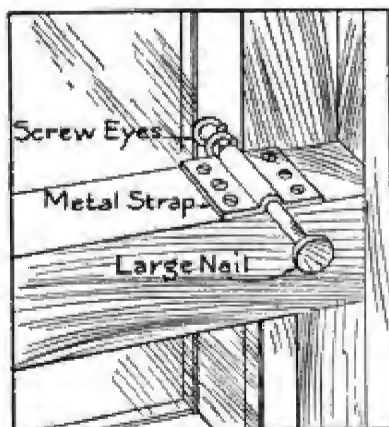


its place as shown in the sketch. The jaws were opened to the desired width and the lower jaw placed against the edge of the board, and

I ran the wrench along the same as a marking gauge. The corner on the end jaw made the mark.—Contributed by W. D. Castle, Gridley, Ill.

Home-Made Window Lock.

A handy window stop that will permit either sash to be raised or lowered and locked in position can be made with two screw eyes, a large nail and an iron strap.



The iron strap is bent to the shape shown in the illustration and drilled for six screws, by which it is fastened to the top of

the lower sash. Two screw eyes are screwed into the frame of the upper sash, one in front of the other, with the openings horizontal and in line at right angles to the glass.

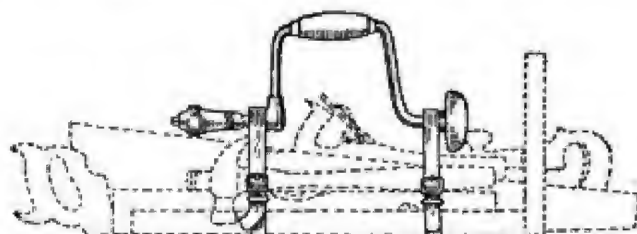
The nail is inserted under the strap and pushed in the screw eyes to lock the window. This arrangement allows air to be admitted to the room without fear of intruders climbing through the window.—Contributed by W. A. Jaquythe, Richmond, Cal.

Abrasive for Grinding Valve Seats

If emery cannot be procured for grinding in valve seats, take a piece of glass, any glass will do, and reduce it to a medium powder by pounding with a hammer. Mix the powder with a light oil of any kind and it will grind in a check or air valve quicker and better than the emery used for the same purpose. This is a good thing to remember when sent out from a shop and emery is not always at hand.

Handle for Carrying Tools

Carpenters, electricians, plumbers and others who carry tools, will find



The Brace Makes the Handle

the suggestion given by a correspondent of Wood-Worker of considerable assistance. He suggests to arrange the tools in a compact parcel, leaving the brace out, and placing two straps, one around each end of the bundle. Before buckling the straps, place the brace on top of the pack, then fasten the straps over each end of the brace, and you will have a handle which will greatly reduce the tedium of carrying tools any distance.

Tempering a Chisel

Heat the chisel about $1\frac{1}{2}$ in. up from the cutting edge to a dark cherry red, then cool the edge in water and rub it with an emery stick or a whetstone. Let the heat run down to a dark straw color, then cool the edge again and brighten as before. Let the heat draw to the color of pigeon blue, then cool the entire chisel. Chisels tempered this way will stand much better than those tempered in the ordinary way.



Wood-Block Printing on Fabrics

When one hears of wood-block printing he usually thinks of the crude wood blocks used by printers some 10 or 15 years ago. More recently wood-block printing has been taken up by art craftsmen and we are beginning to revise our ideas about the craft.

Not much is required in the way of equipment for the performance of wood-block printing: A smooth, close-grained wood that will hold color on its surface and a few carver's tools for cutting the outline. Hard maple will answer for the wood. It is so common that there will be no trouble in obtaining it.

The beauty of the effect will depend upon the appropriateness of the design. A beautiful design is not necessarily a complicated one. The accompanying illustration shows some good effects obtained with simple designs on hand-cut blocks. The design must, of course, be traced on the block the reverse of what is wanted on the fabric.

Simple, one-color effects are very satisfactory. Where one knows his materials and is ambitious, he may make use of several blocks successively, getting a combined color effect in a manner quite similar to the way a printer gets pictures of different colors.

On textiles, such as burlap, monks' cloth and curtain and pillow-cover material, use colors ground in oil and thinned with turpentine, only enough to make them of a consistency similar to printers' ink. Apply the color to the block evenly and impress it on the cloth. If the colors are in their origi-

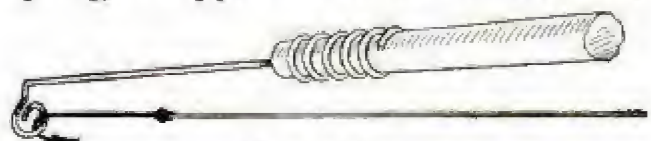


The Blocks and Their Work

nal intensity, they should be "greyed," softened by the addition of black.

Removing a Snagged Fishhook

A device for unhooking a snagged fishhook can be made of the taper end of an old curtain spring and a stick or old fishing pole. A part of the coil is straightened out and a ring bent on the end, large enough to pass over the sinkers. The ring is left open so it can be placed over the line at any point. The remaining coil of the spring is slipped on the end of the stick

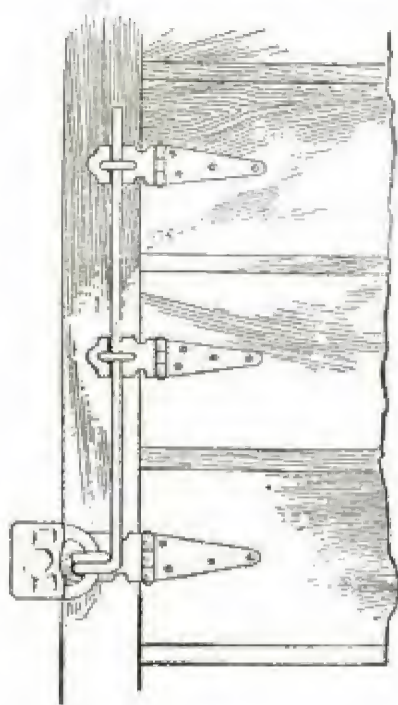


Ring on Hook

and fastened with screws or staples. The illustration shows how the device is applied to the fishhook.—Contributed by J. H. Norrell, Augusta, Ga.

Locking Several Drawers with One Lock

A series or row of drawers can be secured with one lock by using the device shown

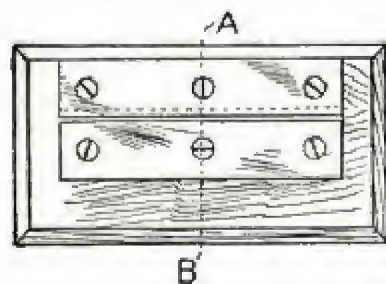


in the sketch. This method takes away several dangling locks and the carrying of many keys. A rod is used through the various staples over the hasps. The rod is upset on one end and flattened

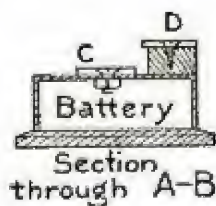
to make sufficient metal for drilling a hole large enough to insert the bar of a padlock. If the bar is made of steel and hardened, it is almost impossible to cut it in two.—Contributed by F. W. Bentley, Huron, S. Dak.

Testing Small Electric Lamps

The accompanying sketch shows the construction of a handy device for testing miniature electric lights. The base is made to take in an electric flash lamp battery. Two strips of brass, C and D, are connected to the battery. The lamp is tested by put-



Lamp Tester



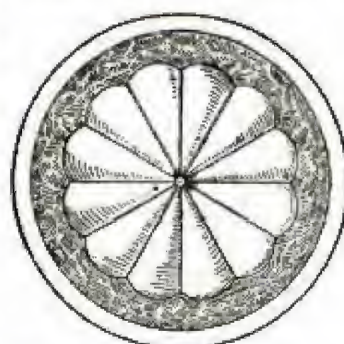
ting the metal end on the lower brass strip and the side against the upper one. A great number of lamps can be

tested in a short time by means of this device.—Contributed by Abner B. Shaw, North Dartmouth, Mass.

How to Make a Pin Ball

The pin ball shown in the illustration is made of calfskin modeling leather and saddler's felt. Two pieces of leather are used, and one piece of felt, all three being cut circular to a diameter of about 3 in. The felt may be about $\frac{1}{2}$ in. thick, and leather of a deep brown color is recommended.

Moisten the leather on the back side with as much water as it will take without showing through the face. Lay it on a sheet of heavy glass or copper, or other hard, smooth, nonabsorbent material. Place the design, which has been previously prepared, over the face of the leather. Indent the outline of the design with a nutpick or any other pointed tool that will not cut the leather. Remove the pattern, and go



Made of Leather and Felt



over the outline again to deepen the tool marks.

The space between the border and the design is now stamped with a cup-pointed nail set, care being taken not to cut the leather, especially if the tool be new. Rubbing the edges of the nail set over a piece of emery paper will serve to dull them, if they are too sharp.

When the designs have been worked on the leather, paste or glue the leather to the two sides of the belt, and punch a hole in the center through which to place a cord for hanging up the ball.

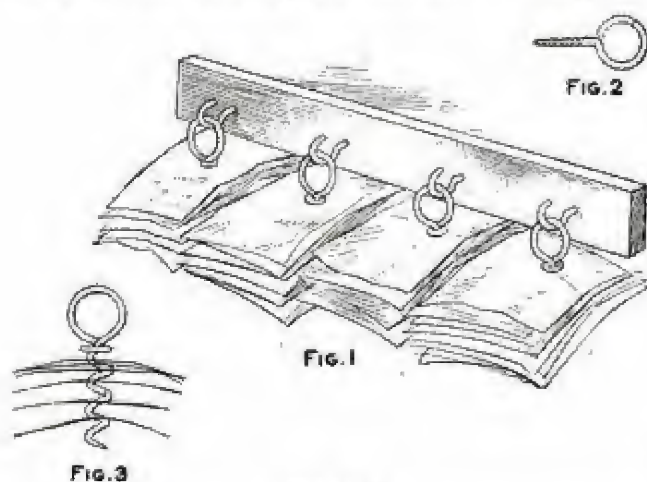
Cleaning Woodwork

An easy method of removing the dirt and old varnish at the same time around a kitchen sink is told by a correspondent of National Magazine as follows:

Make a soft soap from common yellow laundry soap, and when it is almost cold stir in one tablespoonful of concentrated lye and one-half cupful of kerosene. When the mixture becomes a heavy paste, it is ready to be spread over the woodwork with a paint brush. Allow the soap to remain for a day and a half, then wash it off with plenty of hot water. The woodwork will be clean and ready for varnishing when it dries out.

Bill File Made of Corkscrews

An ordinary corkscrew makes a convenient file for small bills or memoranda. It may be thrown in any position without danger of the papers slipping off. A rack to hold a number of files can be made of a wood strip (Fig. 1) fitted with hooks or screweyes cut in a hook shape, as shown in Fig. 2.

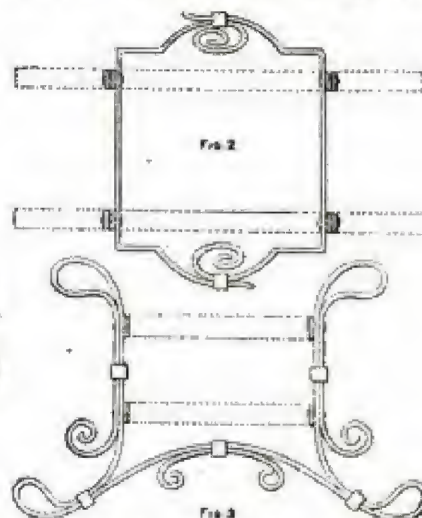


Bill File

Single bills may be separated from the others and will remain separated as in Fig. 3.—Contributed by James M. Kane, Doylestown, Pa.

Ornamental Metal Inkstand

The metal required for making this stand is $\frac{3}{16}$ in. in width and may be



Inkstand and Details of Frame

steel, brass or copper. The shaping is done as shown in Figs. 2 and 3. There are, in all, eight pieces to be bent. The two supports are each formed of one piece of metal with the exception that the end scroll pieces on the under side are made separately. Eight rivets are required to fasten the two horizontal rings to the supports. The glass receptacle can be purchased at a stationery store.

Holding Eyeglasses Firm

Persons who wear nose-glasses and who are troubled with excessive perspiration, should chalk the sides of the bridge of the nose before putting on the glasses. The latter will then never slip, even in the warmest weather. If the chalk shows, use a pink stick, which can be purchased from any art school or supply store.

Substitute for Gummed Paper

Gummed paper is a great convenience in the home especially for labels, but it is not always found among the household supplies. The gummed portions of unsealed envelopes in which circulars are received can be utilized for this purpose. Quite a large label may be made from these envelope flaps.

Repairing a Broken Phonograph Spring

As I live a great distance from a railroad station, I did not care to pay the price, and await the time necessary to deliver a new phonograph spring to replace one that broke in my machine, and I repaired the old one in a creditable manner as follows:

I forced the two ends of the break out where I could get at them, then heated each end separately with a pair of redhot tongs and turned a hook or

A Small Bench Lathe Made of Pipe Fittings

The most important machine in use in the modern machine or wood-working shop is the lathe. The uses to which this wonderful machine can be put would be too numerous to describe, but there is hardly a mechanical operation in which the turning lathe does not figure. For this reason every amateur mechanic and wood-worker who has a workshop, no matter how small, is anxious to possess a lathe of some

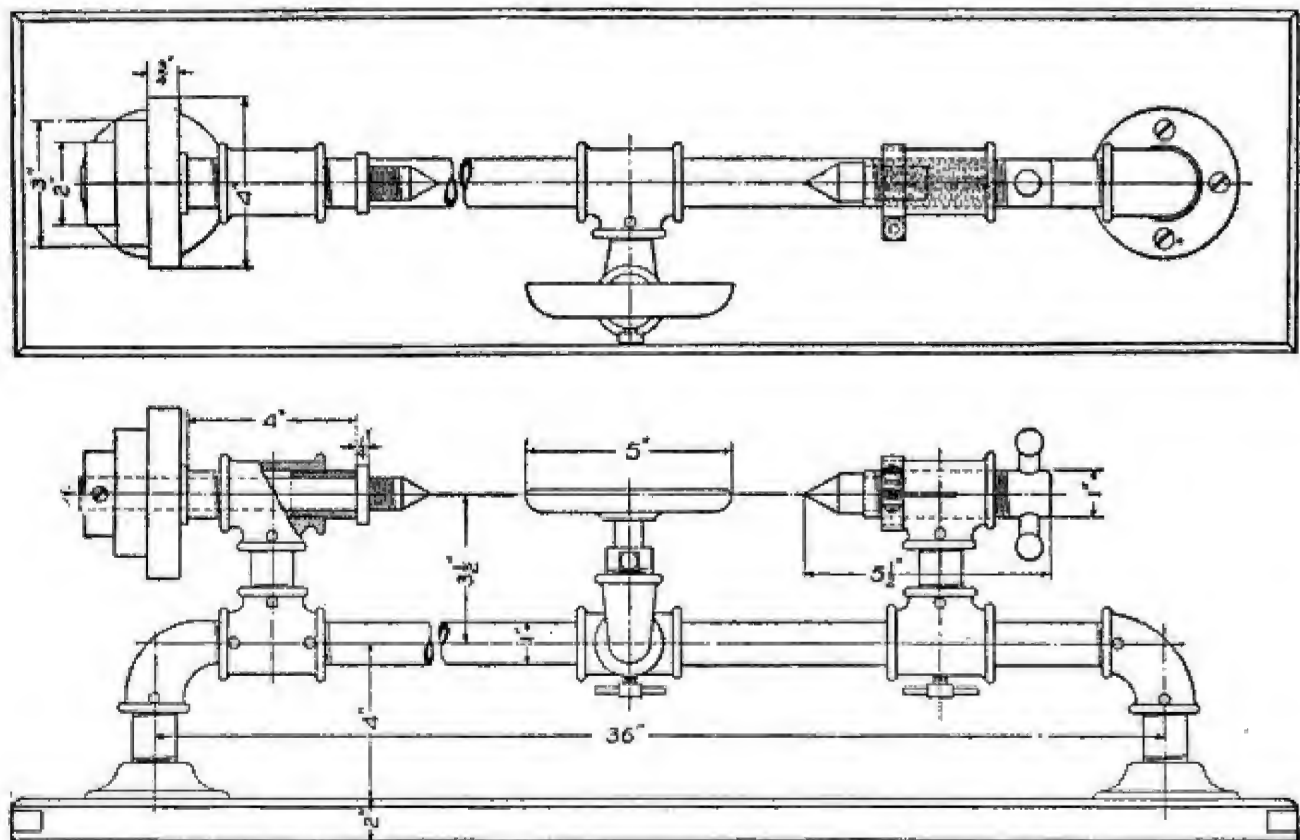


Fig. 1—Details of Lathe

lap on them the same as the joints in knock-down stovepipes. When the ends were hooked together, the spring worked as good as new. The heated portion did not affect the strength of the spring.—Contributed by Marion P. Wheeler, Greenleaf, Oregon.

¶ If you wish to know whether or not the door or telephone bell rings during your absence, place a little rider of paper or cardboard on the clapper in such a way that it will be dislodged if the bell rings.

sort. A good and substantial home-made lathe, which is suitable for wood-turning and light metal work, may be constructed from pipe and pipe fittings as shown in the accompanying sketch.

The bed of this lathe is made of a piece of 1-in. pipe, about 30 in. long. It can be made longer or shorter, but if it is made much longer, a larger size of pipe should be used. The headstock is made of two tees, joined by a standard long nipple as shown in Fig. 1. All the joints should be screwed

up tight and then fastened with $\frac{3}{16}$ -in. pins to keep them from turning. The ends of the bed are fixed to the base-board by means of elbows, nipples and flanges arranged as shown. The two bearings in the headstock are of brass. The spindle hole should be drilled and reamed after they are screwed in place in the tee. The spindle should be of steel and long enough to reach through the bearing and pulley and have enough end left for the center point. The point should extend about $1\frac{1}{2}$ in. out from the collar. The collar can be turned or shrunk on the spindle as desired. The end of the spindle should be threaded to receive a chuck.

The tailstock is also made of two tees joined by a nipple. The lower tee should be bored out for a sliding fit on the bed pipe. The upper one should be tapped with a machine tap for the spindle which is threaded to fit it. The

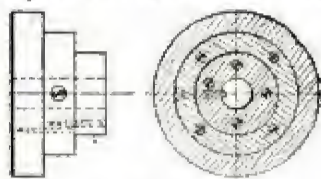


Fig. 2

spindle has a handle fitted at one end and has the other end bored out for the tailstock center.

Both the tailstock and the headstock centerpoints should be hardened. A clamp for holding the tailstock spindle is made of a piece of strap iron, bent and drilled as shown. It is held together by means of a small machine screw and a knurled nut. The tee should have a slot cut in it about one-half its length and it should also have one bead filed away so that the clamp will fit tightly over it.

The hand rest is made from a tapering elbow, a tee and a forging. The forging can be made by a blacksmith at a small expense. Both the lower



Fig. 3

tees of the hand-rest and the tailstock should be provided with screw clamps to hold them in place.

The pulley is made of hardwood pieces, $\frac{3}{4}$ or 1 in. thick as desired. It is fastened to the spindle by means of a screw, as shown in Fig. 2, or a key can be used as well.

Care must be taken to get the tailstock center vertically over the bed, else taper turning will result. To do this, a straight line should be scratched

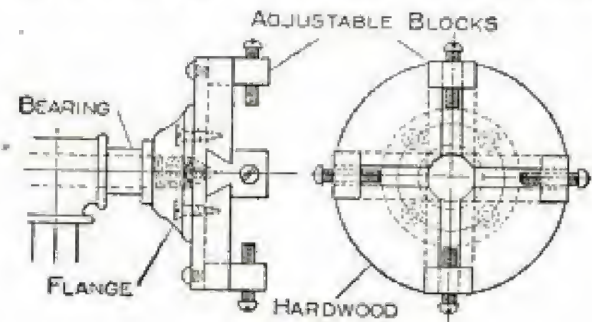


Fig. 4—Chuck

on the top of the bed pipe, and when the tailstock is set exactly vertical, a corresponding line made on this. This will save a great deal of time and trouble and possibly some errors.

The two designs of chucks shown in Figs. 3 and 4 are very easy to make, and will answer for a great variety of work.

As the details are clearly shown and the general dimensions given on the accompanying sketches, it should not be a difficult matter for the young mechanic to construct this machine.—Contributed by W. M. Held, Laporte, Indiana.

Holder for Flexible Lamp-Cord

The holder is made of a round stick—a piece of a broom handle will do—as shown in Fig. 1. It is about 1 in. long with two notches cut out for the strands of the cord. These holders are easily made and will answer the purpose almost as well as the ones made in porcelain. Painting or enameling will improve not only their appearance, but also their insulating properties. Sev-



Fig. 1

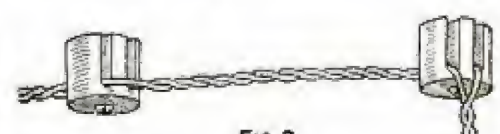


Fig. 2

Ceiling-Cord Holder

eral of them can be used along a line, as shown in Fig. 2.—Contributed by M. Musgrove, Boissevain, Man.

Support for Double Clotheslines

Anyone using a double clothesline over pulleys will find the arrangement shown in Fig. 1 for supporting the

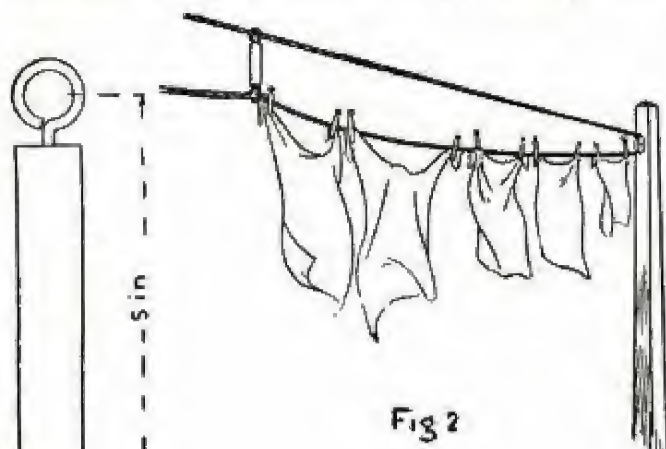


Fig. 1

Holder on a Clothesline

lower line quite convenient. The support is made of a piece of $\frac{3}{4}$ -in. square or round wood which has a screw-eye turned into each end. The line is run through these screw-eyes as shown in Fig. 2.—Contributed by W. W. Up-DeGraff, Fruitvale, Cal.

Hot Pan or Plate Lifter

Unless a person uses considerable caution, bad burns may be suffered when taking hot pies from an oven. If one reaches in and takes hold of the pie pan with a cloth, the arm is liable to touch the oven door and receive a



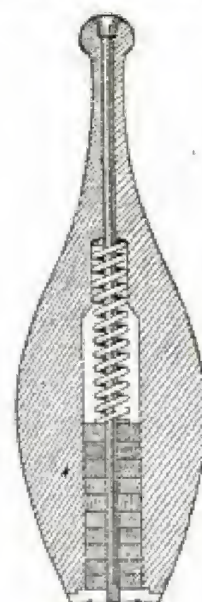
Lifter on Pie Pan

burn. To obviate this, I made the device shown in the sketch for lifting hot pie pans and plates. The handle is of pine about 18 in. long, and the two loops are made of heavy wire. The ends of the first loop of wire are put through the handle from the back, as

shown, and then bent so as to stand out at an angle. The second loop is hinged to swing free on the opposite side of the handle. In use, the hinged side of the loop is dropped under one edge of a plate or pan and the rigid loop is then hooked under the opposite side. The weight of the pan or dish draws the loops together and there is little or no danger of a spill. The same lifter will pick up any size of plate or pan from a saucer to the largest pie plates.—Contributed by E. J. Cline, Ft. Smith, Ark.

Weighting Indian Clubs

An ordinary Indian club can be fixed so that different weights may be had without changing clubs. Each club is bored to receive lead washers which are held in place by a spiral spring. A bolt is run through from the handle end and fastened with a round nut. The lead washers and spring slip over the bolt as shown in the illustration. Changing the number of washers changes the weight of the club.—Contributed by Walter W. White, Denver, Colo.



Venting a Funnel

When using a tight-fitting funnel in a small-neck bottle, trouble is usually experienced by the air causing a spill. This can be easily remedied by splitting a match in half and tying the parts on the sides of the stem with thread.—Contributed by Maurice Baudier, New Orleans, La.

A screw may be turned into hardwood easily, by boring a small hole and lubricating the screw threads with soft soap.

Wood-Working for Beginners

By IRA S. GRIFFITH

Making a Magazine Stand—Typical Methods of Making Doweled, Keyed Tenon and Housed Joints

CHAPTER XIV

In Fig. 93 is shown the perspective of a magazine stand which has been chosen to introduce three new kinds of fastenings or joints. Figure 94 gives the dimensions and from them the stock bill is to be made out. In ordering, it may be advantageous to combine the lengths of the shelves and of the sides. It should be noted that the shelves, of $\frac{3}{4}$ -in. stock, are slightly narrower than the sides. They might be made of the same width, but in the first construction any little variation in the location of the joints makes no noticeable difference.

Square up the different pieces as indicated in the drawing, and shape their ends. The making of the joints comes next. Those on the shelf ends may be made first.

Figure 95 shows the joint for the two middle shelves, the housed joint. (1) Place the two shelves on the bench, face edges up, and square two knife

shall be 14 in. If the pieces were cut the correct length, this should leave

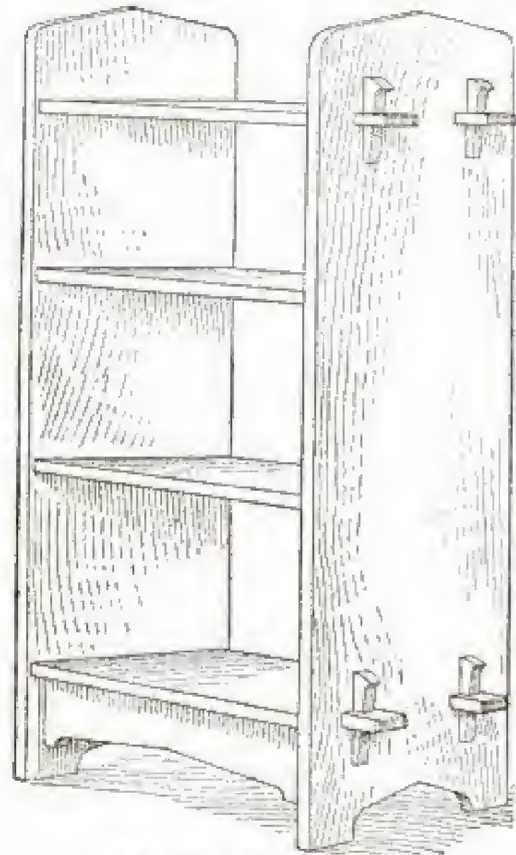


Fig. 93—Magazine Stand

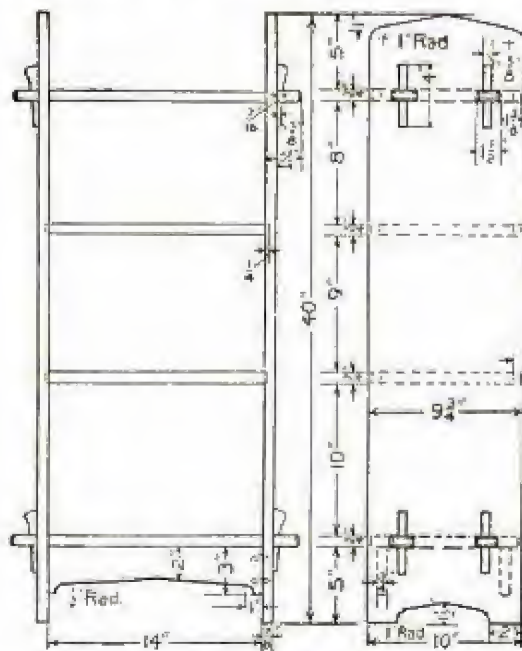


Fig. 94—Magazine Stand Details

$\frac{1}{4}$ in. between each line and the end of the piece. (2) Separate the pieces and with the knife and try-square scribe knife lines entirely around each piece at each end. (3) With the gauge set to $\frac{5}{8}$ -in. gauge on the two broad surfaces and on the ends as in Fig. 96. (4) With the backsaw rip to the gauge lines and cross-cut to the knife lines, keeping the kerf on the waste wood. Saw to the lines accurately so that no paring need be done.

Now make the tenons on the upper and lower shelves. (1) Place the shelves on the bench, face edges up and even the ends. (2) Square knife lines across the edges, equidistant from each end, with a distance of 14 in. between. If there was trouble in making the two previous pieces so that their length had to be made shorter than what the draw-

lines across them—one at each end—so that the distance between the lines

ing called for, of course the distance just specified must be shortened correspondingly. (3) Separate the pieces

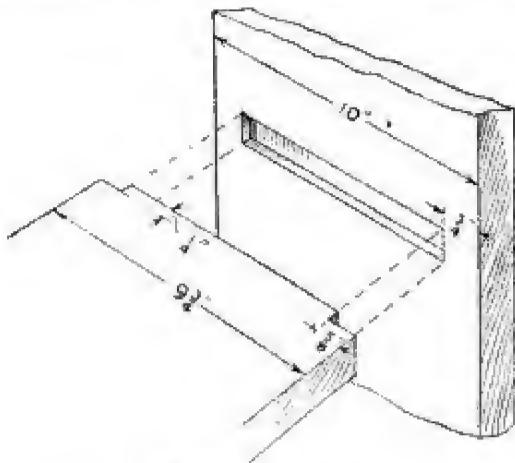


Fig. 95—Shelf Joints

and scribe lines entirely around each end corresponding to the knife lines just made on the face edges. (4) Lay the rule along this line, Fig. 97, and with the knife, point off spaces as indicated. (5) Setting the gauge spur in the mark nearest the edge, gauge all the tenons on the two broad surfaces as far back as the knife lines just made and also across the ends. Reset the gauge to the other mark and repeat until all are marked.

Before these tenons are worked or cut, the mortises for the keys should be laid out. (1) From the knife line that represents the shoulder of the



Fig. 96—Gauging the Ends

tenon, measure toward the end of the tenon $\frac{1}{2}$ in. less than $\frac{7}{8}$ in. The sides of the stand are $\frac{7}{8}$ in. thick and this

$\frac{1}{2}$ in. less is to insure the pins pulling up tight against the sides of the stand. (2) On the upper side of the shelf measure on toward the end from this line $\frac{1}{16}$ in. Square sharp pencil lines across the tenons at these points. (3) Carry the first line entirely around the piece so that it will be across the under side of the board as well. (4) Since the pins or keys have slant to make them wedge, the second line will need to be only $\frac{3}{8}$ in. further out toward the end of the tenon. (5) Lay the ruler along these lines as was done in Fig. 97 and mark off points to indicate the gauge settings for the sides of these mortises. (6) Gauge both sides of the board, and knife the pencil lines be-

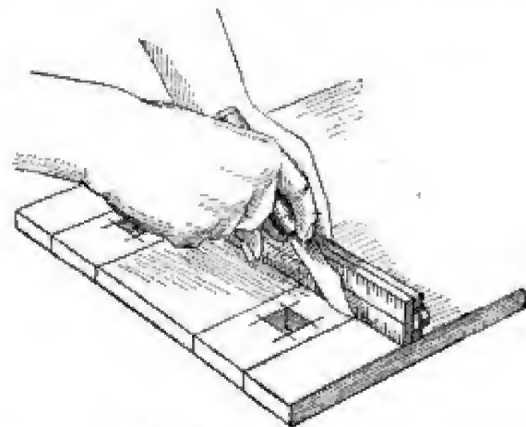


Fig. 97—Marking Spaces

tween these gauge lines. This knifing is to make it easier to chisel the mortise ends accurately. The chisel can be set in knife lines but not in pencil lines. A little thought will make it clear why the knife was not used at the first lining.

Work the tenons and mortises for the keys. (1) Rip with the backsaw to the lines, keeping the kerf in the waste, then cross-cut the exterior shoulders. To cut the inclosed shoulder it will be necessary to bore a hole, and then, using a key-hole saw, cut parallel and very near to the line. The remaining part may be pared away with the chisel, working from both sides. The ends of the tenons are to be chamfered slightly. (2) To work the mortises, bore a hole, and then, working from this hole, pare out to the lines. Bore from the smaller opening, the lower side of the shelf.

Everything is now ready for working the corresponding openings or mortises in the two sides of the stand. (1) Lay the two sides on the bench with the face edges up, and even the ends. (2) Measure off and square knife lines across the edges at the places where the mortises are to be made. If the shelves are of uniform thickness, both sides of the mortises may be laid off by measurement. If not, it will be safer to lay off only the lower lines now and locate the upper lines by superposition. (3) Separate the pieces and square the lines across the face sides, that is, the inner sides. (4) Determine now and mark the way the parts are to rest in the final assembling. (5) By laying the tenons on the corresponding cross lines for the mortises, locate the points from which the gauge settings are to be taken, Fig. 98. (6) For the mortises of the upper and lower shelves, bore in each a series of holes close enough to one another to make one connected opening. Use as large a bit as the mortise will allow safely. With the chisel, work from the hole toward the lines as was done in making the mortises for the keys. (7) In working the mortises into which the ends of the middle shelves are to be housed, it will be necessary to chisel lines parallel to the given lines, about $\frac{1}{8}$ in. in the waste, then work the mortise to depth. After this the sides may be pared to the knife lines without danger of making the mortises too wide. In roughing out the bottoms, the chisel is to be held bevel side down. When nearly to depth a router (Fig. 99) may be used.

The keys or wedges may be made in a variety of shapes. The essential thing is to so design them that they will fit properly and not be likely to break. This matter of proper fitting is the only thing that necessitates definite measurements. (1) Square up the keys to length, having first made a face edge and obtained the proper thickness. (2) Midway between the ends, square two lines across the face side a distance apart equal to the thickness of a shelf or $\frac{3}{4}$ in. Along one of these lines, AB,

Fig. 98, measure from the face edge $\frac{7}{8}$ in. Along the lower, CD, Fig. 98, measure $\frac{3}{8}$ in. The outline of the re-

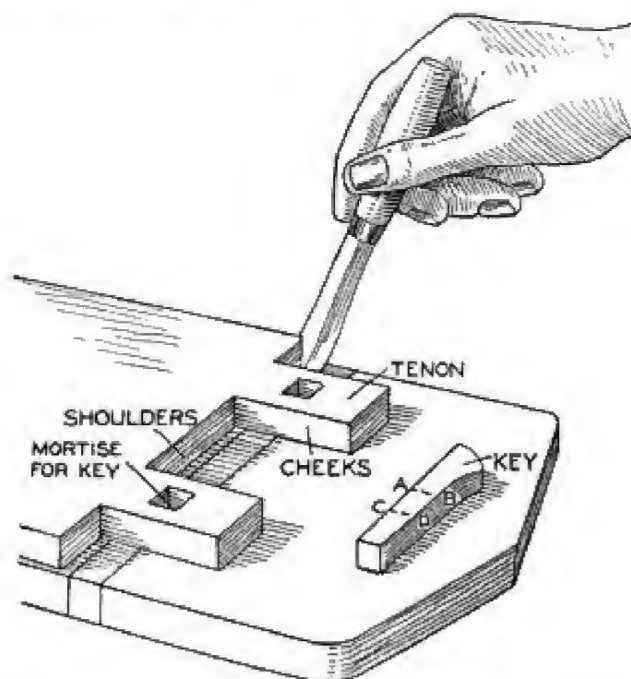


Fig. 98—Marking Mortises

maining unworked edge of the key, whatever its shape, must pass through these two points.

The two braces which are to be placed under the lower shelf are to have their ends doweled into the sides. Use a dowel $\frac{3}{8}$ in. in diameter. Dowels can be purchased put up in bundles, each stick about a yard in length. Cut each pin about $1\frac{1}{2}$ in. long. Slightly round the arrises and with the tenon saw or back saw, saw a shallow slot the full length of the pin. This is to allow any surplus glue in the bottom of

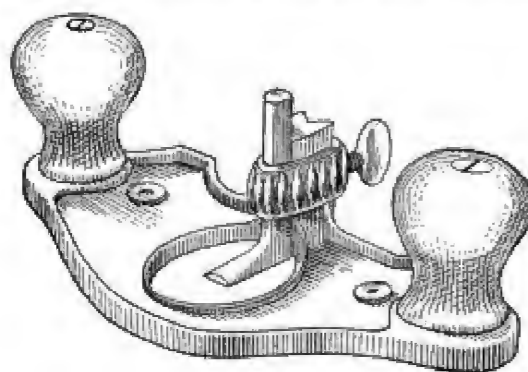


Fig. 99—Router

the hole to escape when pressure is applied to force the dowel in. If the dowel were to fit snugly and the glue not allowed to escape when the pin is

pounded in, the board might be split by the pressure of the glue. The most important thing in making a dowel

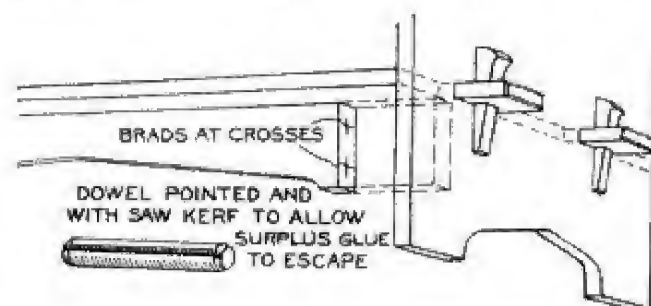


Fig. 100—Marking Holes for Dowels

joint is to get the holes laid out and bored in exactly corresponding positions. The centers for the holes may be

(To be continued.)

laid out by measurement; but as easy a way, one that insures greater accuracy, is to drive two small brads into one of the members where the centers are to be, and snip off the heads so that the nails project about $\frac{1}{8}$ in. (Fig. 100.) Place the member against the other in its exact position and press these brads into the side of the other member. Remove the piece and the brads, using pincers for the latter, and then carefully bore the holes to depth. With a stick or a small brush, place glue on the sides of the holes that are in the ends of the brace, and insert the dowels. The stand is now ready to be assembled.

A Stringless Package

The usual way to do up a flat package is to turn over the two corners of the wrapping paper at each end and then fold the projecting ends close to the contents, whereupon a piece of string or tape is tied snugly around the package, forming a cross on each side. There is a way to do up such a package firmly and securely without the aid of string, tape or adhesive of any kind, says Photo Era.

The object, which must be flat and

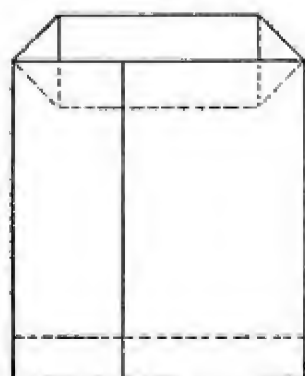


Fig. 1

Folds in the Paper

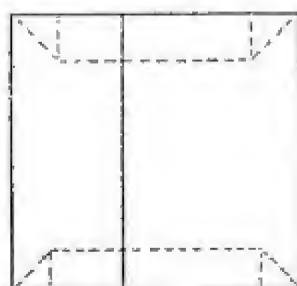


Fig. 2

not over $\frac{1}{4}$ in. thick, is enclosed in a sheet of wrapping paper as usual, but the ends which project say, 1 to 2 in., are not disposed of in the ordinary manner. Instead, they are folded or tucked in. While the package is held firmly between the body and the edge of the counter or table, one side of the

uppermost end is evenly tucked inside. The dotted lines in Fig. 1 indicate its position inside the package. Then the other side of the wrapping-paper is folded over toward the body, the edge sharply creased, and this side also tucked in close to its fellow. Finally pass the thumb and forefinger along the outside edge to insure close contact of both edges. After treating the other end of the package in the same way, the contents are held securely therein, but it is virtually open at both ends and permits inspection by the post-office officials in case it is sent by mail. If desired, the outside flap may be pasted closely to the body of the wrapper. The dotted lines in Fig. 2 indicate the appearance of the package with the position of the ends as they are tucked out of sight.

Making a Clock Run by Changing Its Position

Sometimes, especially in cold weather, when an alarm clock stops, it will run if placed on its back, face or side. While a clock in any of these positions is not very useful or attractive, it is much better to have it run in that position than not at all, as it may be the only clock in a house, where the alarm feature is needed.

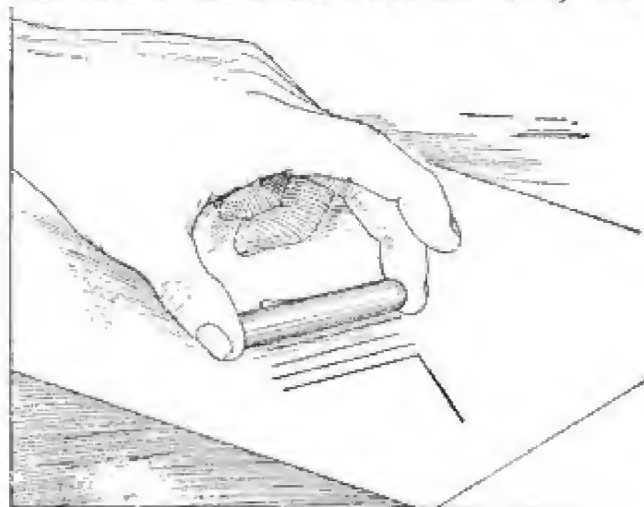
To Make "Centering" Unnecessary

For drilling a hole in a chucked piece, centering is just one operation too many, if this method is followed:

First, face off the end of the piece, making a true spot at least as big as the diameter of the drill. Put a center punch mark where the tool lines indicate the center of revolution. This serves as a rough guide for placing the drill between the tailstock center and the work as usual. Clamp a tool in the tool-post and, on starting the lathe, bring it in contact with the drill and keep it firmly so until the drill is in fully up to the lips. This prevents the drill from wobbling, and when once in true up to its size, it cannot change any more than under any other starting conditions. After being entered, the drill does not need the tool, which should be backed out of contact.

Fountain Pen Cap Used as a Ruler

When it is necessary to draw a short line and there is no ruler at hand, take

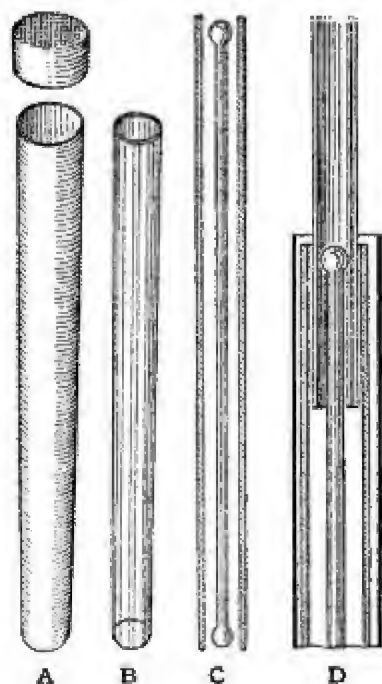


Ruling Lines

off the cap of your fountain pen and use it as a ruler. If the cap is fitted with a retaining clip, all the better, as this will prove a safeguard against slipping.

Vanishing Handkerchief Trick

The necessary articles used in performing this trick are the handkerchief,



vanishing wand, a long piece of glass tubing, about $\frac{1}{2}$ in. shorter than the wand, and a paper tube closed at one end and covered with a cap at the other, says the Sphinx. The handkerchief rod, shown at C, is concealed

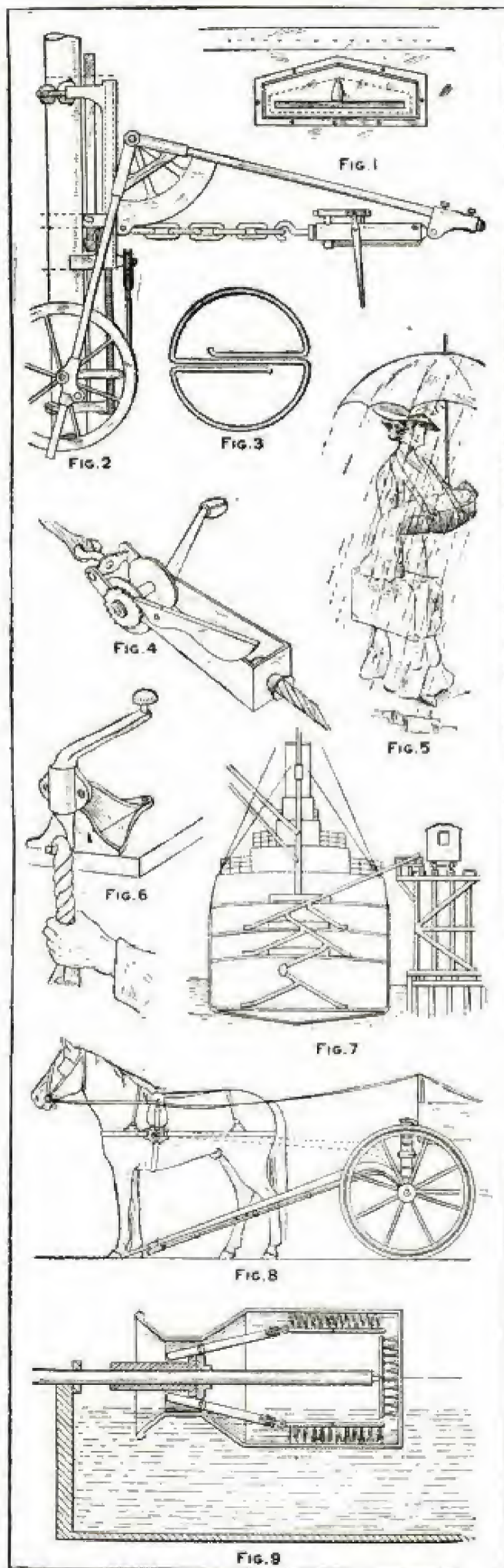
in the paper tube A before the performance. The glass tube B, after being shown empty, is put into the paper tube A, so that the handkerchief rod now is within it, unknown to the spectators. The handkerchief is then placed over

the opening of the tube and pushed in by means of the wand. In doing this, the handkerchief and the rod are pushed into the wand, as shown in D. After the wand is removed, the cap is placed over the paper tube, and this given to someone to hold. The command for the handkerchief to vanish is given, and it is found to be gone when the glass tube is taken out of the paper cover. This is a novel way of making a handkerchief vanish. It can be used in a great number of tricks, and can be varied to suit the performer.

Removing Glass Letters from Windows

Glass letters are removed in the same way as metal letters, by applying caustic soda or potash around the edges of the letters. As the cement softens, manipulate the point of a pocket knife under the edges of the letter until the caustic works completely under and makes it easy to lift the letters. With care and patience, every letter may be thus taken off without breakage.

INTERESTING PATENTS



LETTER SLOT FOR TRUNKS—This letter slot attachment (Fig. 1) converts an ordinary trunk into a safe receptacle for the depositing of mail. The slot opening is provided with a spring operated guard, which closes automatically and prevents the intrusion of dust or other matter into the trunk.

POLE-CARRIER AND ERECTOR—A device to take the place of a gin pole in pole erection is shown in Fig. 2. It comprises a tripod with adjustable front legs hinged at the top and united at the bottom by a curved axle carrying a pair of large wheels. The long rear leg has a swivel on its end to which is attached a second pair of wheels, the whole, when the hinged legs are straightened out, forming a truck for the transportation of the pole. The truck carries the pole to the hole in a horizontal position, then, by the force of a pneumatic cylinder, the hinged joint is partially folded, thus raising the pole to an upright position over the hole, into which it is lowered.

DOUBLE KEY RING—Figure 3 is a double key ring, the purpose of which is to separate the keys into two groups, so that they may be more readily accessible when desired. One section, for instance, may be used for office keys and the other for house keys, so that when searching for a certain key it will not be necessary to fumble over the entire set before finding it. The double ring is made of a single length of wire, the ends of which are located within the ring, where they are not liable to catch and tear the pocket.

ROPE-TIGHTENER—A rope tightener comprising an elongated rectangular frame, a winding spool mounted in the frame, and a ratchet rotated by the spool, is shown in Fig. 4.

CHILD-CARRIER—The conditions under which the inventor of this child-carrying basket (Fig. 5) believes it will prove of value are clearly shown in the illustration. When one hand is occupied in holding up an umbrella, and the other is holding a suitcase or some other load, it is quite obvious that some means must be provided for the carrying of a child.

SPONGE-CLOTH WRINGER—Figure 6 is a device for wringing the cloths used for mopping or sponging up water or other liquids. The cloth is doubled over the hook and the turning of the crank arm wrings the liquid from it.

CHUTE CONVEYOR FOR LOADING STEAMSHIPS—A special chute conveyor for steamships, the patents for which have been acquired by an American railroad company, is shown in Fig. 7. It consists of a combination of chutes extending at an angle to each other, one below the other. Hinged gates are provided at the intersections to direct the discharge. In one position the gates shut off the discharge from the upper to the lower chutes, and in the other shut off the delivery chutes on one level so that the material will drop to a lower level.

LIGHTNING HITCHER AND DETACHER—Figure 8 is designated as a lightning hitcher and detacher. The tugs are of special design, carried along the shafts. At the outer ends of the tugs are special attachment means, which are engaged with the harness by a simple movement. The horse may be completely detached from the vehicle by a movement of the driver's foot.

INTERIOR WASHER AND POLISHER FOR MILK CANS—A brush arrangement for cleaning the interior of milk cans is shown in Fig. 9. The device is attached over a water receptacle in such position that a certain amount of water may enter the can after the latter has been pushed into position over the brushes. The milk cans may be whirled by hand around the brushes, or may be held stationary while the brushes are rotated.

PRACTICAL OR UNIQUE

ADJUSTABLE MEASURING DEVICE—This link scale (Fig. 10), formed of alternating single and double links in the same manner as a chain, is designed for measuring the interior circumference of curved surfaces.

IMPLEMENT FOR REMOVING OBSTRUCTIONS IN PIPES—Attached to the end of the brace (Fig. 11) is a flexible shaft consisting of a close coil of spring wire, at the end of which is a corkscrew-shaped member. When inserted in a pipe or drain as shown, the screw, revolved at the end of the flexible shaft by turning the brace, is expected to engage with the cloth or other material forming the obstruction, after which the obstructing article is drawn out in a manner somewhat similar to drawing a cork from a bottle. A wire spiral guide just above the screw acts as a guide.

ROPE-CLIMBING DEVICE—A rope-climber, comprising a pair of lever grips for the hands and a pair of similar grips for the feet is shown in Fig. 12. The foot grips are provided with wire loops for the insertion of the climber's feet. In using the device, the climber first supports himself with the hand levers, his weight causing them to solidly grip the rope. While supporting himself thus, he draws his feet and the foot-grips up the rope. He then allows his weight to rest upon the foot-grips, causing them to engage with the rope, and pushes the hand-grips up.

HAT-FASTENING JAWS—Figure 13 is a hat-fastener invented to take the place of hatpins. In shape and action the device is somewhat similar to a pair of ice tongs, the jaws being engaged with the hair by the operation of a rod concealed in the crown of the hat.

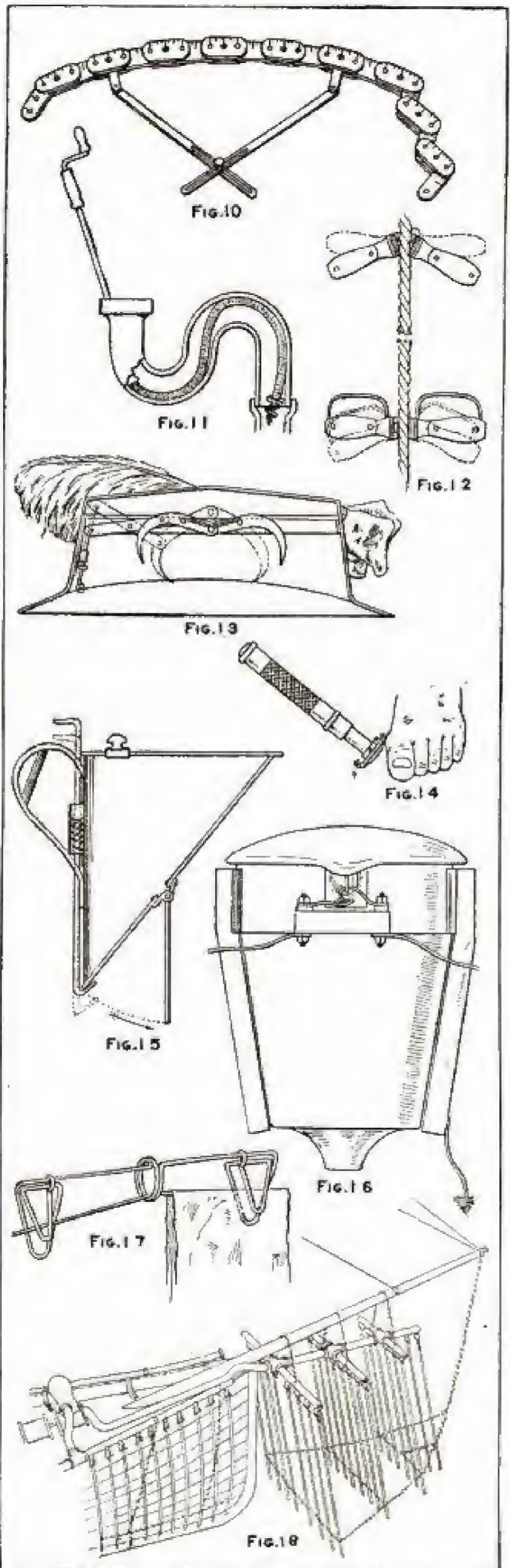
SAFETY CORN-CUTTER—The advent of the safety razor has led to the invention of several devices of like nature for other purposes, such, for instance, as cutting the finger nails. The latest is a safety tool (Fig. 14) for the paring of corns.

SELF-DUMPING HAND-SCOOP—Figure 15 is a self-dumping scoop, the lower part of the inclined wall of which is hinged, so that it will swing out when the latch is released, thus providing a large opening for the escape of its load. The latch is pushed downward out of operation by pressing the thumbpiece located just above the handle.

ELECTRICALLY IGNITED ORCHARD FIRE POTS—In many fruit belts, specially in the West, fire pots are utilized as a means of preventing frost from destroying the fruit crops. In Fig. 16 is shown an electrically ignited fire pot for such purpose, any number of which may be connected up in a circuit. Normally, the fire pots are covered, but the contact points in each are so arranged that a wire will fuse and trip the catch holding the cover down when the current is turned on, and at the same time ignite a wick which sets fire to the fuel. The covers, of course, are weighted so that they will fly open when the catch is tripped. In this manner all the fire pots in the orchard are instantly ignited by turning on the current.

CLOTHESPIN—A clothespin made from a single length of wire is shown in Fig. 17. It is so shaped as to form a ring in the center, through which the clothesline passes.

APPARATUS FOR RELEASING GROUNDED VESSELS—A curious water-jet apparatus, designed for the release of grounded vessels, is illustrated in Fig. 18. Curved pipes are arranged down each side of the bow, 10 on a side, and 26 pipes, grouped to form a triangle, are hung from the bowsprit. Water, forced into the manifolds by a pump, is discharged from the ends of the pipes, it being presumed that these jets will wash away the obstructing bed.



ONE of Michigan's railroad companies established a small flag station, and the grocer, whose knowledge of railroading was very limited, was commissioned agent.

The first morning after he had donned the "regulation suit" he awoke hearing the "limited" whistle in the distance, hurriedly slid into his trousers, and, flag in hand, ran out upon the platform and began wildly waving the flag across the track. The train stopped, and the conductor alighted, with the inquiry:

"Where's your passengers?"

"Haven't any," replied the agent.

"Then why in thunder did you stop us?"

"W-well, I—I—thought perhaps there might be some one who would want to get off here."—Detroit Free Press.

♦ ♦ ♦

A schoolmaster had just finished a lesson on "Food" when a little boy put up his hand. On being asked what he wanted he replied:

"Please, sir, Jones said he knew a baby that was brought up on elephant's milk, and it gained ten pounds in weight every day."

"Jones ought not to tell you such rubbish," said the master. Then, addressing Jones, he added, "Tell me whose baby was brought up on elephant's milk?"

To which Jones hesitatingly replied: "Please, sir, it was the elephant's baby."—Tit-Bits.

♦ ♦ ♦

"He was always a lucky fellow."

"What do you mean?"

"When he fell out of his airship he plumped straight through the skylight of a hospital."

♦ ♦ ♦

The man with the old clock under his arm laid it on the jeweler's showcase. "I wish you'd see what is the matter with this," he said.

The jeweler removed the dial, screwed his eyeglass into place, and inspected the works of the ancient timepiece.

"Nothing is the matter with it—now; its sufferings are over."

"Well, how much do I owe you?" asked the man.

"Nothing," answered the jeweler. "This isn't a professional treatment. This is a coroner's inquest."

NEW BOOKS

[Any book mentioned or reviewed here may be ordered direct from the publishers or through Popular Mechanics Book Dept., 225 Washington Street, Chicago.]

THE TESLA HIGH-FREQUENCY COIL: Its Construction and Uses—By George F. Haller and Elmer Tiling Cunningham. 119 pages, 12mo, cloth, with 56 illustrations. \$1.25. A working manual for advanced amateurs on the construction of high-frequency coils. D. Van Nostrand Company, New York.

SHOP KINKS—By Robert Grimshaw, M. E. 393 pages, 12mo, illustrated, cloth, \$2.50. This is the fifth edition, revised and illustrated, of this useful book for machinists. The Norman W. Henley Publishing Company, New York.

THE ART OF ROADMAKING—By Harwood Frost, B. A. Sc. 544 pages, 6x9, illustrated, cloth, \$3.00. This comprehensive treatise takes up all the various problems and operations in the construction and maintenance of roads, streets and pavements. The volume also contains an extensive bibliography which will be found a help to any one interested in roadmaking. The Engineering News Publishing Company, New York.

THE TELEGRAPHIC TRANSMISSION OF PHOTOGRAPHS—By Thorne Baker, F. C. S. 146 pages, 12mo, illustrated. Constable & Co., Ltd., London.

ELEMENTARY TELEGRAPHY: A Manual for Students—By H. W. Pendry. 216 pages, 12mo, illustrated, cloth, \$1.00. Whittaker & Co., London. The Macmillan Company, New York.

THE ANNUAL BLUE BOOK OF SOUTHERN PROGRESS, for 1911, is a 64-page pamphlet containing a statistical epitome of the past and present of the South. Price, 25 cents.—The Manufacturers Record, Baltimore, Md.

The elderly matron with the bundles, who was journeying to a point in Wisconsin and occupied a seat near the middle of the car, had fallen asleep. On the seat in front of her sat a little boy. The brakeman opened the door of the car and called out the name of the station the train was approaching. The elderly woman roused herself with a jerk.

"Where are we, Bobby?" she cried.

"I don't know, grandma," answered the little boy.

"Didn't the brakeman say something just now?"

"No. He just stuck his head inside the door and sneezed."

"Help me with these things, Bobby," she exclaimed. "This is Oshkosh. It's where we get off."

♦ ♦ ♦

Captain H. J. Hollinshed, of the navy, recently told this story about a comet:

"We had a good view of the comet off Tarifa in the Mediterranean. The sailors did not like it. They sent a committee to me to get my opinion on it. 'Captain,' said the spokesman, 'we want to ask your opinion.' 'Yes, my lad,' said I. 'What about?' 'About that thing up there,' he replied, pointing at the comet afloat in the western sky. 'Very well,' said I. 'But first tell me what you think it is yourself.' 'Well, sir,' said the spokesman, 'we've talked it over very carefully, and we've about come to the conclusion that it's a star sprung a leak!'"

♦ ♦ ♦

While one thing essential to a cultured lawyer is a thorough knowledge of Latin, it is not necessary that he should parade his classical knowledge, for he might be "taken down a peg," as was the young lawyer who displayed his learning before an Arkansas jury. His opponent replied: "Gentlemen of the jury, the young lawyer who has just addressed you has roamed with Romulus, canted with Cantharides, ripped with Euripides, soaked with Socrates, but what does he know about the laws of Arkansas?"

♦ ♦ ♦

"He absolutely lacks the business instinct."

"Does he?"

"Why, he'd have no more idea of business than to open a garage in Venice."—Chicago Record-Herald.

A DEFINITE DATE PLEASE

The recent change of the date of issue of Popular Mechanics Magazine from the 17th of the month to the 20th brought forth the following from a subscriber:

Oh tell me, Mr. Editor:

You of pen and power,

Why do you keep us waiting

So many lonesome hour,

For that good magazine of yours

Which on the seventeenth is due.

The dealer says it's "late" again,

And says it's "up to you."

We take our dime and nickel,

That we've saved for thirty days,

And ask for "Pop" from dealer

And it doesn't "seem to feaze"

Him, just a little bit to say,

We've others "just as good as Pop,"

Let me show you them today.

We know, of course, there's "none so good;"

And are obliged to "call his bluff."

All magazines "look good to him,"

He's out "for business" and "the stuff."

So please, good Mr. Editor,

Get "Macks" out on time;

It's good for circulation

And it gets our five and dime.

So keep us happy—cheer us up

And set a certain date

When we can get our magazine

And never have it "late."

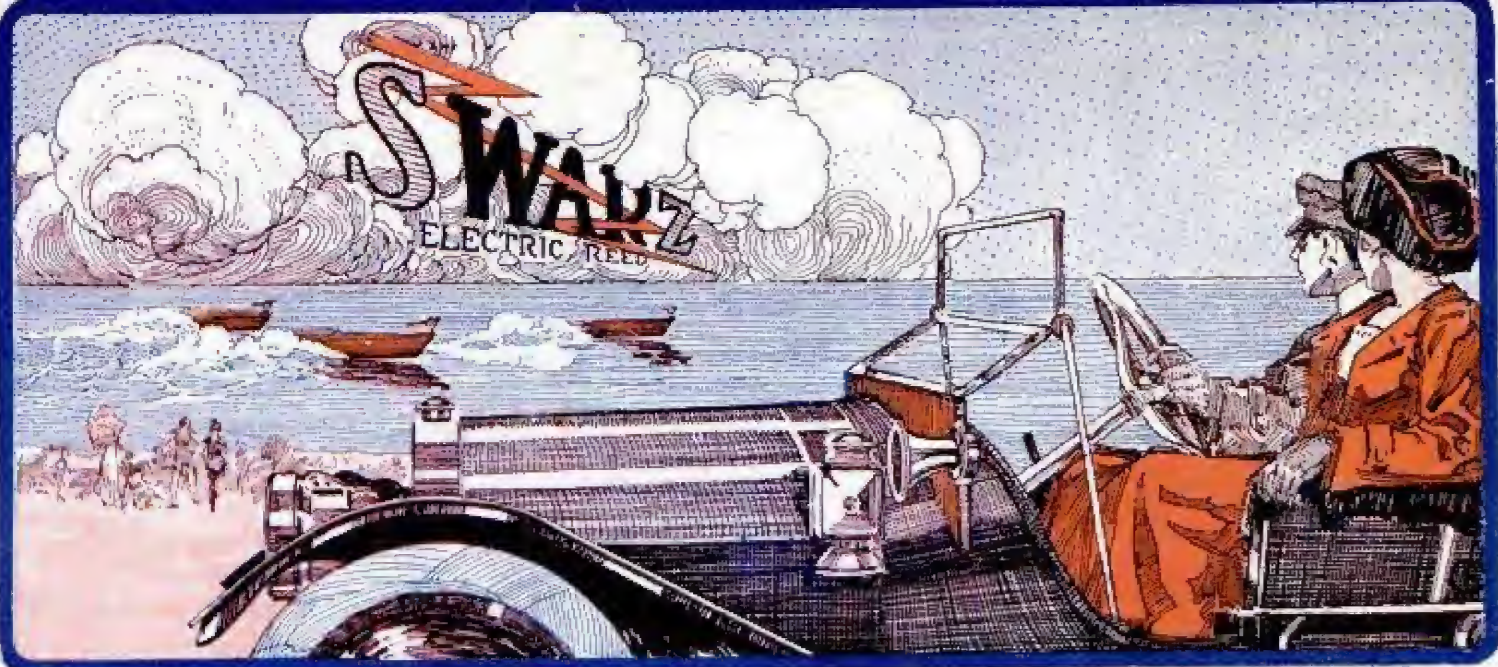
Let that date be what it may

But advertise it well.

Then hustle, bustle, push and pull,

And get it out, in spite of—the dealer.

—By A. C. Pearson, Duluth, Mich.



A Practical Electric Signal Device For Automobiles and Motor Boats

Operated by a button convenient to the driver's seat, either foot or hand, responds instantly, giving any desired length of blast.

Insures you against accidents, clears the road, giving you the "Right of Way."

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SwarZ Electreed Model Z—Complete with highly polished brass horn, hand or foot button (as desired), 10 feet Packard cable, tape, etc., ready to install, . **\$18.00**

SwarZ Electreed Model Y—With heavy metal horn, coated in dark enamel



Model Z



Model Y

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Send Cash or Money Order and we will prepay express charges

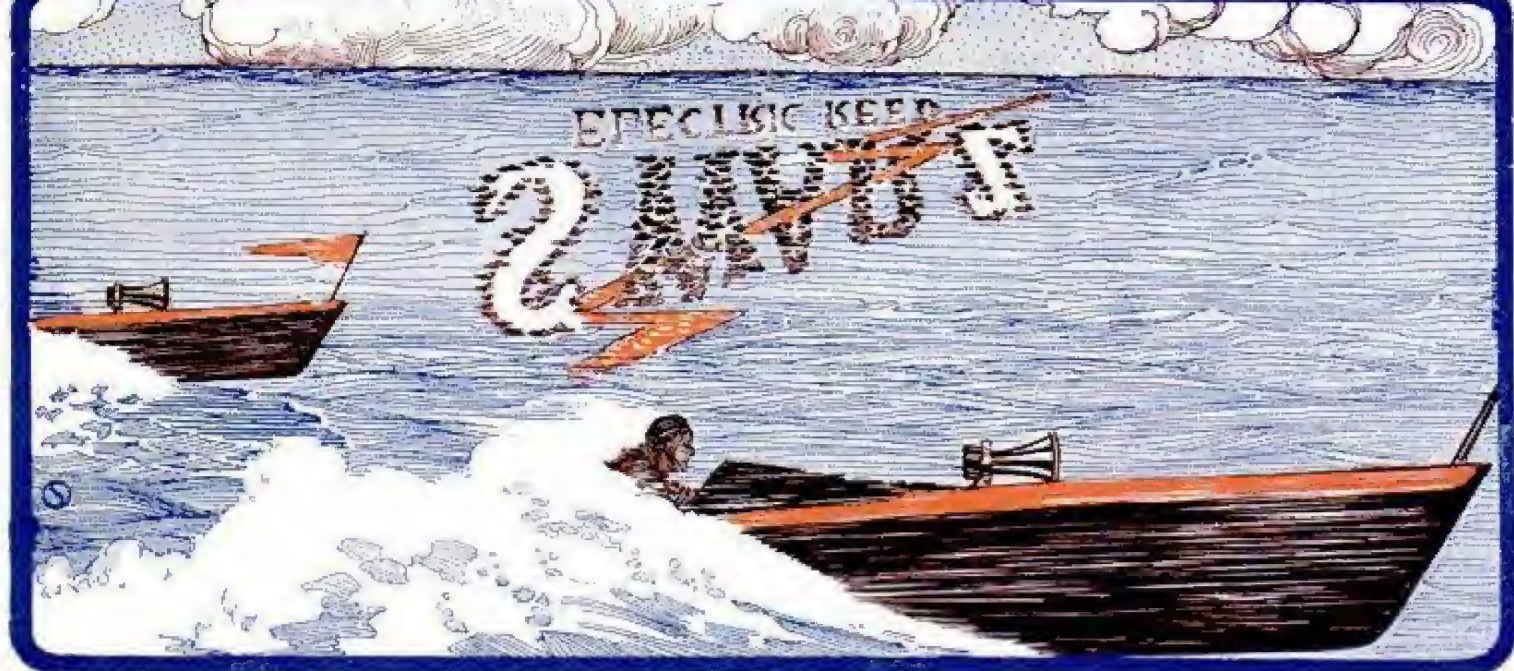
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Model X



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especially treated to withstand weather conditions. Including Packard cable and button, complete, . . . \$18.00

Don't throw away your old horn—use

SwarZ Electreed Model X—(without horn) including Packard cable, buttons, tape, etc., and flexible brass tubing ready to apply to any horn, . . . \$15.00

Prices for Motor Boats

SwarZ Electreed Model V—Waterproof complete with enameled cast iron horn (requires no polishing, will not tarnish or rust) with swivel deck-stand, Packard cable, foot or hand button, tape, etc. \$19.00

SwarZ Electreed Model W—Complete (as in Model V) in highly polished brass, including 10 feet Packard cable, foot or hand button, tape, etc., . . . \$20.00

All Prices F. O. B. Detroit.

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Street _____

City _____

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Model Desired _____

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to realize a remarkable uninterrupted profit for at least 56 years in a project constituting the only worthy absolute monopoly in existence and presenting the following features:

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Competition Impossible
World-wide Importance
Immeasurable Benefit to Humanity**

Basis known to every intelligent human being throughout the world, heartily endorsed by the Public Press and leading Educational, Commercial, Political and Agricultural Authorities everywhere.

The principal owns absolute sole rights for the U. S. and all foreign countries, is widely known and can present abundant Banking, Mercantile and Personal References extending throughout 30 years of Business life.

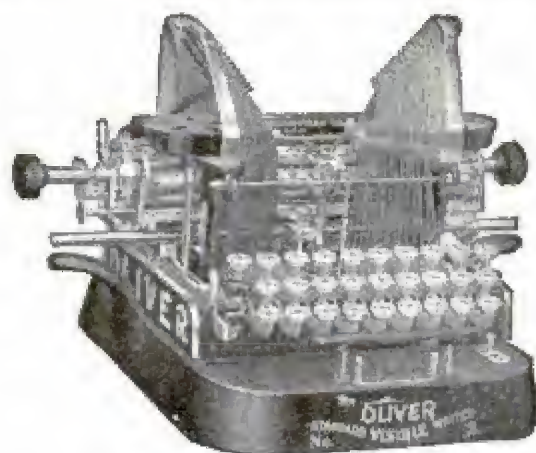
There is a limit to the number who can participate. Immediate answers are invited only from substantial men, stating the amount they can invest if completely satisfied with details. Information with proper references will then be promptly submitted.

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No. 3 Olivers Standard Visible Writers at \$50. On Credit.

We buy and distribute more No. 3 Olivers than any other concern in America. As a result we buy far below the lowest agents' prices.

We send the machines on five days' trial, without any deposit, and let them sell themselves. We have no agents, no salesmen. Our selling cost is only one-seventh the average cost of selling through agents.

Thus we sell these standard machines—listed at \$100—at half that price if sold on credit, or \$47.50 cash.

The machines are complete and in perfect condition. Each is twice inspected. The slightest flaw, or fault, or mark causes us to reject it. Machines sent out to sell themselves must be beyond possible criticism.

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760 Masonic Temple, Chicago

- ☐ Ship me an Oliver No. 3 on 5 days' approval, F. O. B. Chicago.
- ☐ Send more information. Hold the machine for me waiting instructions.

Name

Address

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Visible writing. Lines 9 inches long.
Writing in colors without changing ribbon.
The Universal keyboard.
Choice of three beautiful types.
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Absolutely perfect alignment.
84 characters written with 28 keys.
20 carbons at one writing if desired.
Utter simplicity. The instruction book enables one to write immediately.
Light in action—light in weight.
Lifetime durability.

Over 350,000 Olivers are now in use. They are used by 183 railroads. They are used by the largest mail-order houses, two of whom use over 1,000 each.

The Oliver is so simple, so durable, so trouble-proof that men who know best, select it. It does any practical thing which any typewriter can do.

Pays for Itself

Every person who writes should in these days use a typewriter. Handwriting is now an apology. It cheapens a person—shows him not up-to-date—indicates that his time is not valuable.

When an Oliver No. 3 can be had at half price, simply by selling to yourself, you can afford the best. At \$5 monthly the machine pays for itself. In a single evening one can learn to use it.

Five Days' Trial No Deposit

We will send this machine on 5 days' trial without any deposit. If you don't want it, return it, and we will pay express. If you accept it, send us \$5, then \$5 monthly until \$50 is paid. Or deduct 5 per cent for cash.

If you want the typewriter sent at once on approval, check the first square in the coupon at the left. If you are not in business, and rated, kindly send a couple of references.

If you want more information, check the second square in the coupon, and a machine will be set aside.

Cut out the coupon, mark and sign it, and send it to us at once. Until the machine meets your full approval, you are under no commitment.

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The fellow that does only what he has to, and spends his spare time in theaters or pool rooms or on the street corner—that fellow does not expect to go very high.

How did your superintendent, or general manager, or foreman, or department chief land the position he holds? By showing knowledge of his work; by proving that he had ability; by getting ready when he was in the same job you now hold.

How can you get into the spot light? How can you mount over the crowd and attract the attention of the "big man"?

By your own efforts properly directed. By being willing to devote to study a part of your spare time. By giving the International Correspondence Schools a chance to direct your efforts and lead you to the front.

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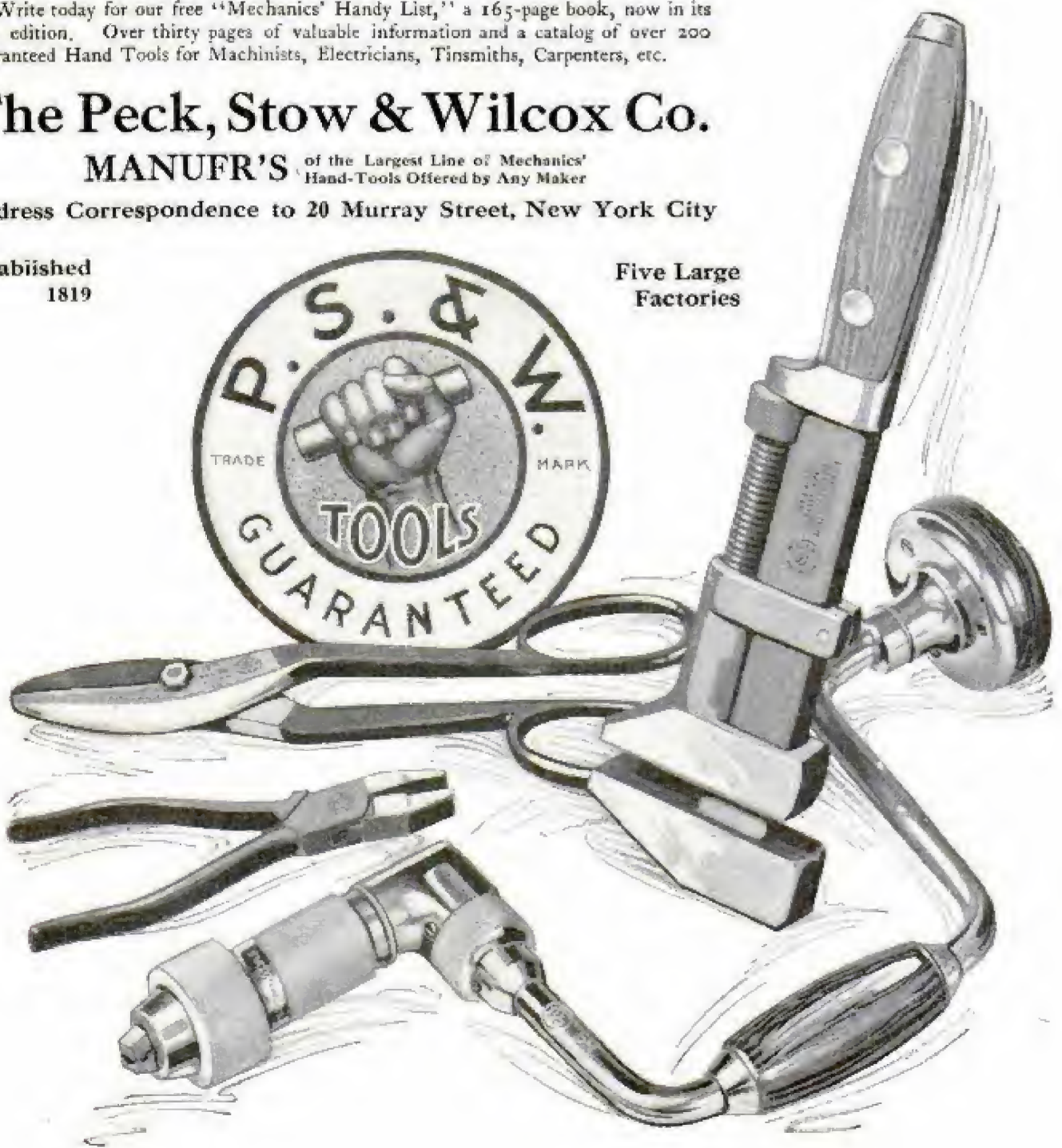
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Make Your Car Run
Smoothly and Greatly
Lengthen its Life.**

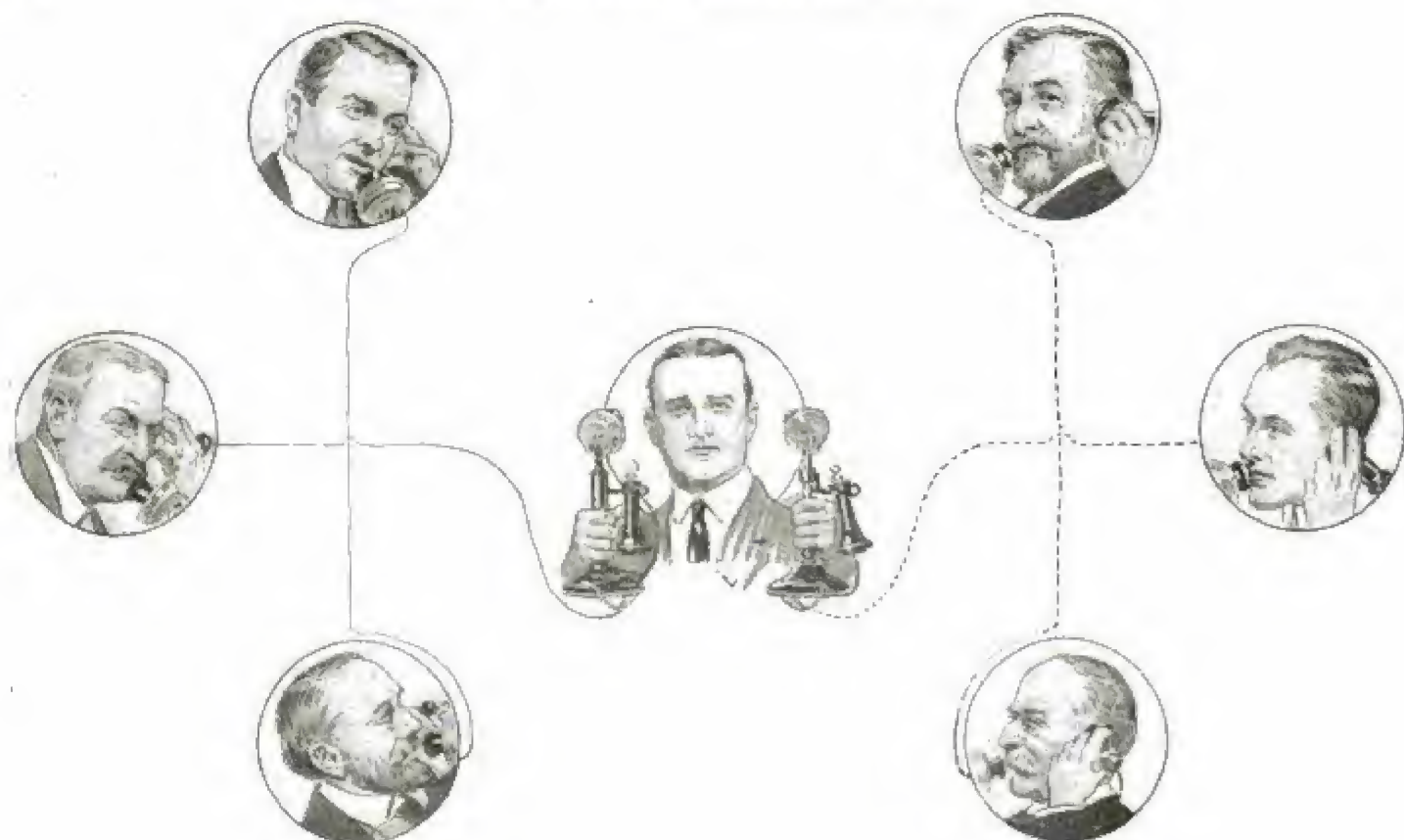
All dealers sell POLARINE lubricants or can get them for you.

POLARINE Oil affords perfect lubrication in tropical or zero weather. It is delivered in sealed cans—1 gallon and 5 gallon sizes—or in barrels and half-barrels. Other POLARINE lubricants in cans of convenient size.

During their long experience in making automobile lubricants, our experts discovered so many useful facts about the care of automobiles that they have prepared a booklet entitled "POLARINE POINTERS." This booklet not only gives valuable hints on lubrication, but it also tells the causes of all kinds of engine troubles.

You may have this booklet FREE if you are an automobile owner. Send to our nearest agency.

Standard Oil Company
(Incorporated)



Half Service Or Double Expense

TWO telephone systems in one town mean a divided community or a forced duplication of apparatus and expense.

Some of the people are connected with one system, some are connected with the other system; and each group receives partial service.

Only those receive full service who subscribe for the telephones of both systems.

Neither system can fully meet the needs of the public, any more than a single system could meet the needs of the public if cut in two and half the telephones discontinued.

What is true of a single community is true of the country at large.

The Bell System is established on the principle of one system and one policy, to meet the demands for universal service, a whole service for all the people.



**AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES**

Please Mention Popular Mechanics

Let Us Put This Piano in Your Parlor
Not a Dollar To Pay Us.

SEND NO MONEY

Enjoy This Piano—Take Your
Own Time—Sent to You
on 30 Days' Free Trial

Write right now and let us put this piano
in your parlor — not a dollar to pay us.

Let us send you our big, free, actual photograph, color-illustrated, handsome book, and offers to trust you absolutely with any celebrated and artistic Reed & Sons Piano on as long time as you want, even three years or more, if you are satisfied after 30 Days' Free Trial. Not a cent to pay down—not a dollar for any of our beautiful styles you select from the book we send you on



REED & SONS PIANOS

Established 1842. Given Highest Award
at World's Columbian Exposition, 1893

We've sold through dealers, jobbers and agents—for over 68 years—but now we have cut out their big profits and are giving the savings to our customers. We have made our direct-to-you wholesale factory prices so low that you can have a celebrated Reed & Sons Piano, for lifelong service, at a price as low as the price of many "cheap" made pianos—and get the highest artistic quality. Our 25-year guarantee bond goes with every Reed & Sons instrument. Hundreds have had generations of enjoyment from our pianos. So can you on our plan and prove it positively at our risk.

Now Sold Direct to
You From Factory

Saves you from \$128.00 to \$222.00 on
price. No Security
— No Interest to
Pay—No Col-
lectors.



Also Self-Playing Pianos

Reed & Sons Self-Playing Pianos now sold on the most liberal plan. Thousands who "never knew a note" are now enjoying our Self-Players. See our offers and prices all explained in handsomest color-illustrated catalog sent Free.

Take Your Own Time
— On Trying and Pay-
ing — We Pay Freight
Both Ways.



Take 30 Days' Free Trial in your home with your family and friends to judge the beautiful tone quality—handsome exclusive design and finish—easy action and splendid satisfaction. After a full year's enjoyment send our Reed & Sons Piano or Self-Playing Piano back and we'll pay the freight if not exactly as represented. That's the fairest offer ever made. It means 365 Days' Approval Test, besides 30 Days' Free Trial and 3 years' time to pay if satisfied. When absolutely satisfied you can pay \$1.00 a week, or by the month, or 3 months, or twice a year. We don't care how. Suit your own time. We want you to be happy with one of our pianos or self-playing pianos—prove it at our risk—right now. Write right now—a Postal To-day—or the Coupon—For Our Big Book.

REED & SONS PIANO MFG. CO., CHICAGO, ILL.
Capital and Resources, \$1,760,000.00—Largest Factory-to-Home
Piano Manufacturers in the World.

Big Book Free

Reed & Sons Piano Mfg. Co.,
253 Wabash Ave., Chicago, Ill.

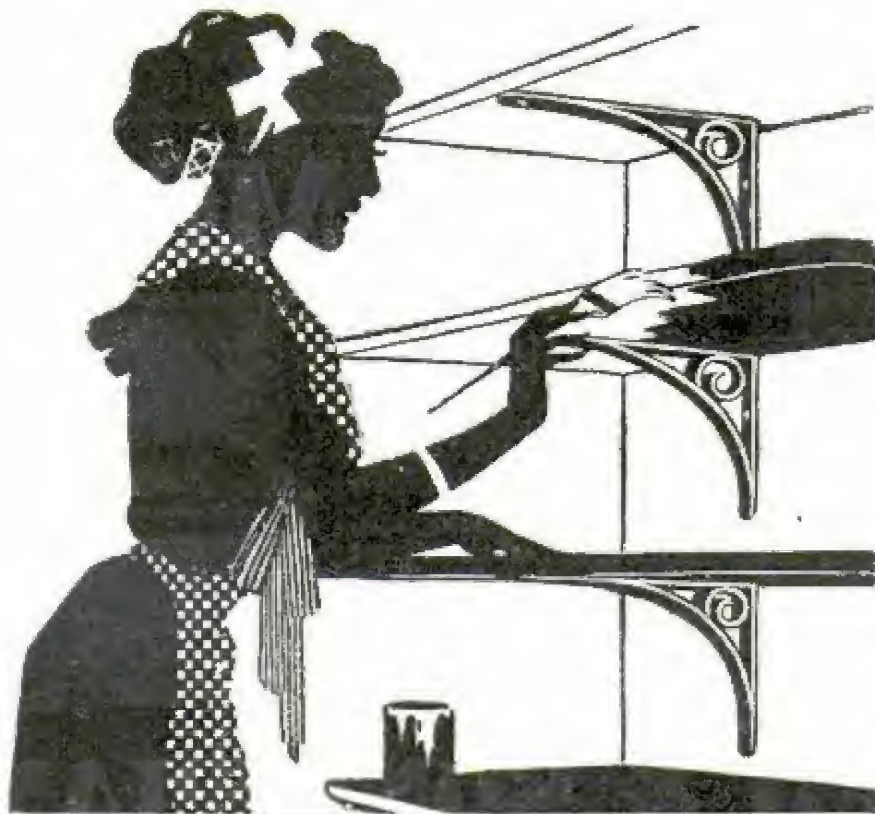
Please send me your Big Color Illustrated Piano Book and offer
FREE. Everything at your risk.

Name _____

Address _____

Town _____ State _____

365 Days Approval Test



Apply White Jap-a-lac Yourself and Have a Clean, Sweet Pantry Shelf

Oilcloth *costs more* and quickly *wears out*. It *cracks* within a *few weeks* and after that grows *musty* and *smelly*. If you cover your shelves with *paper* you must *take it off* every time you *wash* them, and *then* you have to wait at least *half an hour* until the wood *dries* before you put back your *pots* and *pans*. A little bit of *time* and a little bit of *Jap-a-lac* will give you a sanitary, wholesome kitchen. *Stains* can be removed, *smudges* of all sorts cleaned off of Jap-a-lac as *easily* as from a *china plate*. Jap-a-lac has a *gloss* just like the *glaze* of *porcelain*. It endures *forever*.

JAPALAC

Made in 18
different colors and natural
(clear)—renews everything from cellar to garret

"You can't keep house without it"

For hardwood floors; for restoring linoleum and oilcloth; for wainscoting rooms; for re-coating worn-out zinc or tin bath tubs; for brightening woodwork of all sorts; for coating pantry shelves and kitchen tables; for varnishing pictures (when thinned with turpentine) and gilding picture frames and radiators; for restoring go-carts and wagons; for decorating flower pots and jardiniere stands; for re-painting trunks; for enameling sinks; for restoring chairs, tables, iron beds, book cases and for a thousand and one uses, all of which are described and explained in a little book which you can have for a little request on a post card.

For sale everywhere—it wears forever. Look for the name of Glidden as well as the name Jap-a-lac. There is no substitute.

Cleveland, O.

The Glidden Varnish Co.

Toronto, Ont.

Branches: NEW YORK, CHICAGO



All sizes 20c to \$3.00

YOUR HANDS



YOUR hands will thank you for introducing them to **Pummo Soap**.

Pummo is composed of pure vegetable oils, glycerine and the finest Italian pumice.

Pummo has not only all the cleansing qualities of the best toilet soaps, but it does more—removes grease, grime, paint, oil, ink and other stains from the hands in a way which soap alone will not do.

The soap and pumice remove the dirt and stains like magic; the glycerine softens and soothes the skin.

As an effective and instantaneous cleanser **Pummo** stands in a class by itself.

The price of **Pummo Soap** is **5c**— at druggists and grocers.

If your dealer does not have **Pummo** in stock, write us, giving his name, and we will send you a free sample by return mail.

Made by

The N. K. Fairbank Company
CHICAGO



Double the Purchasing Power of Your Money



YOU know that home surroundings exert a wonderful influence on domestic happiness, but you did not know that every room in your home could be artistically furnished at a price that is ridiculously low, did you? THEN you owe it to yourself—your family, to investigate this proposition. Not knowing means a direct loss to you.

MAKE \$1.00 DO THE WORK OF \$2.00

HOW? By having the furniture shipped to you direct from the factory in the natural wood, together with all the materials necessary to give it the proper finish (or stained prior to shipment if preferred) and in assembled, easy-to-put-together sections. Take for example the chair shown in the illustration. You simply put the four assembled sections together, (two sides, front and back) slip the cushion in place, and by this act you have reduced the cost of that piece of furniture exactly, yes, more than half.

You ask: How does this method reduce the price?

FIRST—You pay but one profit only—the manufacturer's profit. All retailers' profits and expenses are done away with.

SECOND—The freight rate on furniture shipped in this manner is very low—about one-quarter of that charged on completed furniture, which charges are always included in the dealer's price to you.

THIRD—The finishing and packing charges are reduced to a minimum.

FOURTH—The size of the factory and therefore the expense of maintenance is reduced, no enormous storage space being necessary. This naturally reduces the manufacturing cost.

Send to-day for our new catalog No. 12 which shows an extensive line of furniture for every room in the house, club or office, each piece backed by our Guarantee of Satisfaction or your money refunded.

BROOKS MANUFACTURING CO., 705 Rust Ave., Saginaw, Mich.

Printype Wins!

New Oliver Typewriter, Equipped With "Book Type," Makes Tremendous Hit With the Public—"Typewrites PRINT"

Sells for 17 Cents a Day

Another great Oliver innovation—PRINTYPE.

Some months ago, without announcement, we placed The Printype Oliver Typewriter on the market.

Today, *one-third* of our output of Oliver Typewriters are Printypes.

It's more than a success. *It's a revolution in typewriter type!*

Printype is the most beautiful, readable, attractive, attention-compelling type ever evolved for typewriters.

Thousands of dollars have been expended in producing this wonderful typewriter type, yet you pay only the regular price of \$100 for the complete machine, the new Oliver No. 5, equipped to write in Printype. You can buy The Printype Oliver on the famous 17-Cents-a-Day Purchase Plan.

Printype is virtually *book type*—the type which the eye has been *trained* to grasp *quickly*.

The type which the crystallized experience of centuries proves best for the printed page.

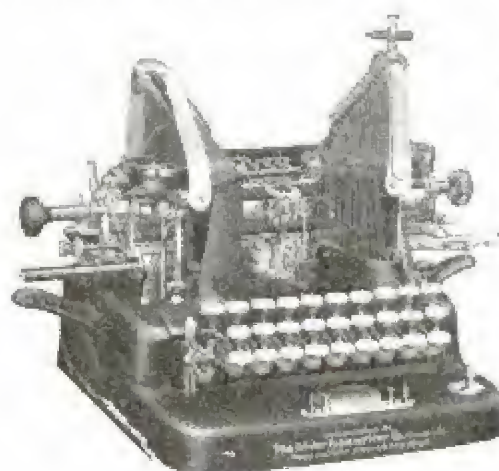
Great Beauty and Attention Value

Printype is the very soul of *symmetry*. The shadings give *body*, *refinement* and *life* which are utterly lacking in the old-style thin outline letters and numerals. It's a delight to the eye.

A letter written in Printype attracts the eye—it's *magnetic*. A Printype letter is so strikingly *attractive*, so *forceful*, so *distinctive* that one unconsciously picks it out from a mass of mail, to read *first*.

Its perfection *compels attention*.

A large part of our sales have resulted from letters like this, sent by interested correspondents to users of the new machine: "For goodness sake, what machine did you use to write that letter?"



The answer—a *Printype Oliver*—makes the sale.

Aids Eyesight—Prevents Errors

Printype aids and rests the eyes. None of the strain on the optic nerve that sharp, thin, outline type imposes. This elimination of *effort* makes it a positive pleasure to read Printype correspondence. Ask the opinion of your oculist or optician. *He knows the value of Printype!*

**Printype —
OLIVER
Typewriter**

The Standard Visible Writer

Printype makes every letter, every numeral, every character employed in the whole wide range of commercial transactions *perfectly plain*.

Wherever *accuracy* is demanded, *Printype* is worth a premium.

A Printype Test by Linotype Operators

One of the hundreds of interesting *Printype* tests was made by various newspaper publishers. Linotype operators of equal dexterity were pitted against each other in a speed contest. One set of operators were supplied with copy written with the *regular* typewriter type.

The opposing operators were supplied with copy written in *Printype*.

It was found that the linotype operator could increase his output *ten per cent*, setting from "Printype" copy, over copy written with the ordinary "outline" typewriter type.

Ask Us to Write You a Letter on The Printype Oliver Typewriter

We want to write you a specimen letter on The Printype Oliver Typewriter and forward a copy of the book, "A REVOLUTION IN TYPEWRITER TYPE." Ask us for details of the "17-Cents-a-Day Purchase Plan" which has added so many thousands to the ranks of typewriter users.

We urge upon you the importance of investigating the new face in Typewritedom—PRINTYPE.

Address Sales Department

(106)

The Oliver Typewriter Company

703 Oliver Typewriter Bldg., Chicago. Agencies Everywhere

Triple the Purchasing Power of Your Money



DO you know that it is the health-giving pull of Nature that makes every gingery water breeze, every glance at a beautiful lake or river, attract the red-blooded human being, and make him want a boat? It's your duty to yourself—to your family—to respond to this influence.

AGAIN—Do you know that by adding a little of your money to a little of your spare time, you can profitably enjoy many a dull hour and own a boat at a ridiculously low cost?

Make \$1 Do Exactly the Work of \$3

HOW? By purchasing the full-sized paper patterns and instructions for a boat, or by purchasing all or part of the material in the knock-down—that is—every piece cut to shape, machined and accurately fitted, so that it will go together but one way only—the right way.

You ask: Why does this method reduce the price? There are five reasons:

FIRST: You are spending a few pleasant hours instead of money in assembling the boat, which reduces the cost to you over half.

SECOND: You do not pay—but wait—space in this publication is mighty expensive. Why tell only part of the story? Our new catalog No. 25, goes into detail, and a postal card will bring it to you. It shows an extensive line of boats, from canoes to cabin cruisers—every one backed by a guarantee of satisfaction or your money refunded. Send that postal now—right now.

BROOKS MANUFACTURING CO.

705 RUST AVENUE

SAGINAW, MICH.

Two Million Dollars' Worth

of Housefurnishings—3,021 Lines—Sacrificed by the Makers.
Sold for CASH or CREDIT at an Equal Price.

The year 1910 was a dull year in furniture. Hundreds of makers at the end of the year were loaded with surplus stocks. They welcomed any offer—even much below cost—to turn warehouse stock into money.

We went to those makers with unlimited money. And we bought up bargain stocks from 180 factories. We bought so low that on hundreds of these articles we can quote half usual prices by selling direct.

All these furnishings—over 3,000—are shown in our Bargain Book No. 24. It makes a mammoth book, but we want to mail it—and mail it free—to everyone who has a home. You may never again see an opportunity to get things for the home so cheap.

Pay As Convenient

If you see something you want here there is no need to pay cash. Our cash and credit prices are exactly identical. Open a charge account, if you wish. Over 600,000 people have such accounts here now.

On the average credit account we allow a year to pay. There is no interest, no security, no red tape. Our customers are all buying things for the home, and we gladly give such people credit. You'll find it convenient to buy on open account.

Bargains In

Furniture	Silverware
Carpets	Chinaware
Rugs	Graphophones
Draperies	Washing Machines
Stoves	Sewing Machines
Ranges	Baby Cabs
Pianos	Lamps and Clocks

Cash or Credit

30 Days to Decide

Nothing we send you is considered a sale until you have it a month. Everything is sent on approval. If you wish to return it for any reason we will pay freight both ways.

Before you buy anything you see the article right in your home. You compare it with others—compare prices

with others. You take no risk whatever in letting us send you whatever you want to see.

Bargain Book Free

This mammoth book—size 10½ x 17 inches—picturing 3,021 things for the home, is mailed free for the asking. It will show you how low beautiful things can be sold when the makers must have money. You'll find a hundred things you want and at amazing prices.

Cut out this coupon—now, before you forget it. Send it to us and we will mail the book.

Cut Out This Coupon

SPIEGEL, MAY, STERN CO.
1517 35th Street, Chicago

☐ Mail me the Bargain Book.

☐ Mail me the Stove Catalog.

Name

Post Office

State

I am particularly interested in



High grade 9x12 rug bargains, bought at auction from largest manufacturer in United States. A saving of 30% is guaranteed on every rug. All patterns and colors. Bargain prices as follows:

Tapestry Brussels Rugs,
9x12 ft. \$11.95 up
Velvet Rugs, 9x12 ft. 13.95 up
Axminster Rugs, 9x12 ft. 17.50 up

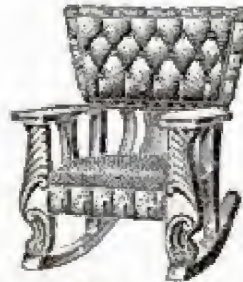
Cash or Credit



No. LX485—English Folding Go-Cart Bargain. Newest 1911 design. We take the factory output at a specially low price. Has steel frame, fabricord leather upholstery and large rubber tires. The best collapsible go-cart on the market.

Factory bargain price \$4.85

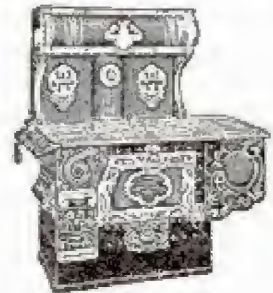
Cash or Credit



No. 50X435—Tufted Back, Upholstered Rocker Bargain. We bought 9,200 at actual factory cost price for spot cash from a manufacturer who required immediate money. This is a beautiful rocker, upholstered in guaranteed fabricord leather. The American quarter-sawn oak frame is finely finished and handsomely carved.

A great bargain. Factory bargain price . . . \$4.35

Cash or Credit



No. 30X1820—Steel Range Bargain. Made in our famous Empire factory. One of the grandest ranges ever built. We guarantee a saving of at least one-third on all stoves sold by us. This style, bargain price from . . . \$18.20

up, according to size.

Cash or Credit

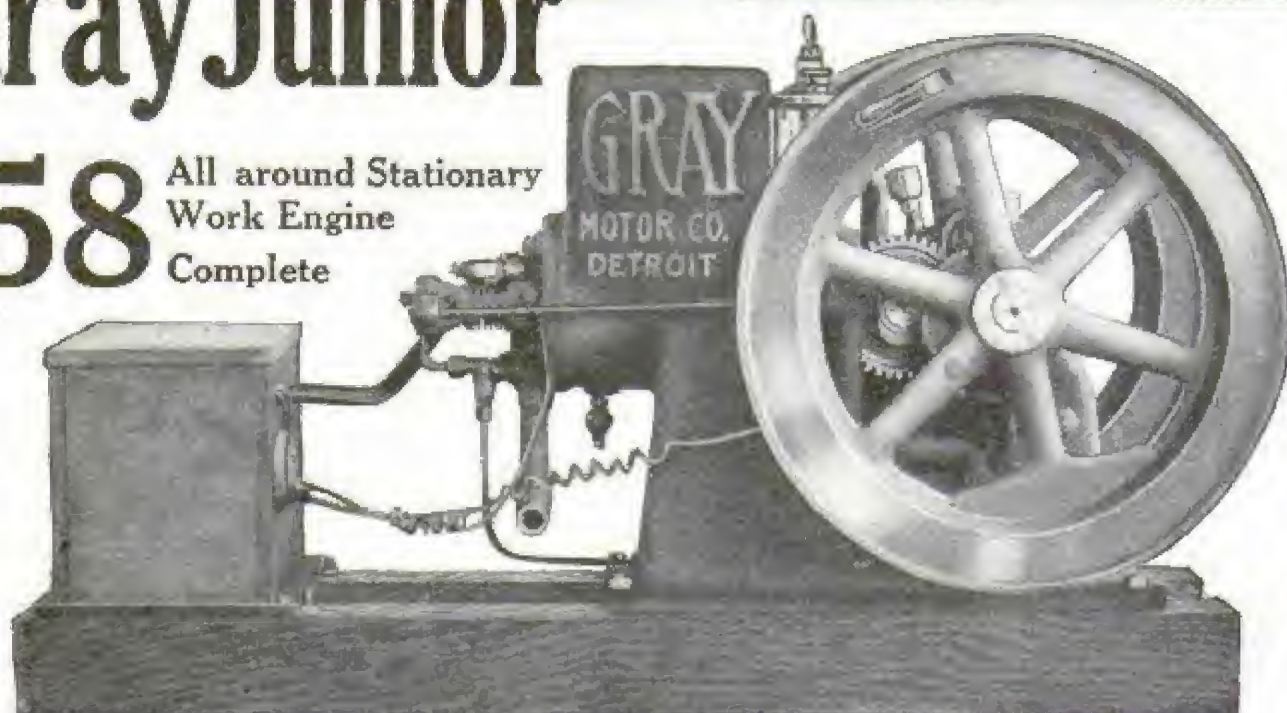
SPIEGEL, MAY, STERN CO., 1517 35th Street, CHICAGO, ILL.

Gray Junior

All Ready to Run

\$58

All around Stationary
Work Engine
Complete



Built Right

A good small motor. Guaranteed the same as if it cost \$500, by a big responsible concern. Made to last a life time. A woman can run it. Hopper cooled. Powerful—good material, workmanship and finish. Comes mounted, already to run as you see it. Put in your gasoline and start it up.

Agents make big money selling it because it sells itself and makes no trouble after it is sold.

It looks good, runs good and is good. Occupies a field distinctly its own because of its high quality.

Write for agent's proposition today.

Gray Farm - Pumping and General Power Motors

Gasoline or kerosene, 3 to 36 horsepower.

6 h.p. Farm Engine, \$94 to \$124 complete.

3 h.p. Farm and Stationary Engine \$65, guaranteed to develop 4 h.p.

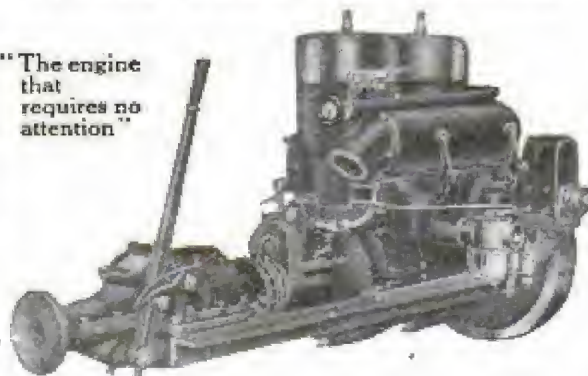
24 h.p. Irrigation Pumping Engine, \$346 - 36 h.p. for \$560.



Gray Marine Motors

For Cruisers, Work Boats
Speed Boats and Canoes

"The engine that requires no attention"



3 h.p. \$65—6 h.p. \$89.50—12 h.p. \$188.00
24 h.p. \$330.00—36 h.p. \$528.00—Complete ready to install in your boat.

Absolutely guaranteed in every detail.

7 to 36 h.p.—1, 2 and 3 cylinders—combination 2 and 3 port.

Bosch High Tension Magneto—the most up to date marine engine built.

Write today for Big New Catalog

[Be sure to specify whether you want Marine or Stationary
Catalog, and what you want to use the engine for]

GRAY MOTOR COMPANY, 532 CHARLOTTE AVENUE Detroit, Mich.

Canadian Gray Motors, Ltd., 532 River Front St., Walkerville, Ont.

WETMORE Adding Machine

An Opportunity to Share in the Profits of this Company

THE Wetmore Adding Machine Company will manufacture the simplest, most reliable, and durable adding machine ever produced. Those who organize the company are men of long and successful experience in manufacturing, and their interests are permanently bound up with those of the company.

The Wetmore Adding Machine is the only adding and listing machine ever produced whose addition does not depend upon springs, gravity, or friction. Every part in its adding mechanism is driven into position by cam, gear and lever.

A Few Prominent Features

1. Accumulators in direct line of sight.
2. Low key board.
3. Visible works.
4. Keys interlocking or flexible, at choice of the purchaser.
5. Especially convenient angle of keyboard.
6. A new and improved method of inserting paper.
7. Lightest operation of any machine on the market.
8. All keys and levers operated by the right hand, the left being free for turning checks.
9. Two sets of accumulators, one for the debit and one for the credit column, a feature which greatly extends the usefulness of the adding machine.
10. Positive operation: must add right or stop, no other alternative.
11. The design permits of substantial construction.

Eight years ago, the inventor, Mr. Wetmore, was engaged by one of the largest adding machine companies as their General Superintendent. At that time, the company had almost no factory equipment. Mr. Wetmore first undertook the redesigning of their machine and his name appears on the late patents. Next, Mr. Wetmore superintended the designing and building of the special equipment, selecting and installing the standard machinery and superintended for five and one-half years the production of what is known as one of the best adding and listing machines on the market today.

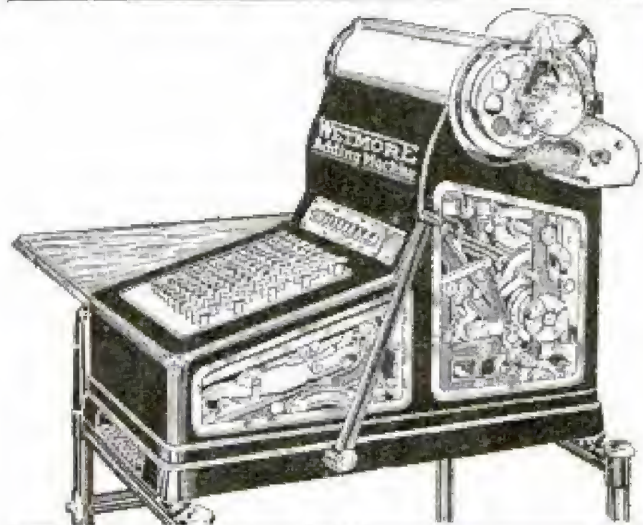
This five and one-half years of building adding machines for the market gave Mr. Wetmore an opportunity to carefully study every other adding machine and this experience convinced him that all adding machines up to this time were designed upon wrong principles.

No one would think of driving a cyclometer on an automobile with a belt. Why? Because belts slip. Why then trust your accounts to a mechanism whose accuracy depends upon its parts being moved by springs? If the spring weakens or the joint in the part becomes corroded or gummed with bad oil or clogged with dirt, you have an incorrect addition.

These troubles led Mr. Wetmore to spend years of time to produce an adding machine whose operation is as positive as a gear drive. If one part in the adding mechanism moves, all the rest must move. If one part is blocked, all parts are blocked. These are features embodied only in the WETMORE ADDING MACHINE.

The Wetmore Adding Machine Co. offers the following very liberal proposition to small investors. We will sell four shares, 7 per cent cumulative preferred stock, par value, \$100.00 per share, for \$400.00. This stock carries a bonus of two shares of common stock. This is the same proposition which is now being made to large investors. This common stock should pay

Not a Spring in Adding Mechanism



More Work with Half the Mechanism

at least 30 per cent when the factory is selling 3,000 machines per year. In addition to this, for the purpose of introducing our machines into every state in the United States, we will give to a limited number of purchasers of the above amount of stock, in each state in the United States, ONLY, an order on the factory for one of our \$400.00 adding and listing machines upon payment of \$200.00 in cash. If the stockholder wishes he may turn in his two shares of common stock in place of paying the \$200.00 in cash, that is, we will accept this common stock at par for payment on this limited number of machines.

For \$400.00 you get \$400.00 of 7 per cent cumulative preferred stock, \$200.00 common stock, and by paying \$200.00 in cash additional, you get a \$400.00 adding and listing machine. Or for \$400.00 you get \$400.00 7 per cent cumulative preferred stock and one \$400.00 adding and listing machine.

Wetmore Adding Machine Co.
Ford Building, DETROIT, MICH.

COUPON

Wetmore Adding Machine Co.,

Ford Building, Detroit, Mich.

Please send me complete information regarding the proposition you advertise in May POPULAR MECHANICS Magazine and reserve for me one of the machines which is allotted to this State, pending my investigation. It is understood that if I am not satisfied in every respect with your proposition there is no obligation incurred.

NAME

ADDRESS

B

**"Why Don't You
Use**

Amatite
ROOFING.
**It Needs No
Painting!"**

EVERYTHING about Amatite appeals to the man with common sense. He can see its superiority at once—the *real mineral surface* which never needs painting; the *two layers of Pitch* which is the only imperishable waterproofing known; the two layers of *heavy Tarred Felt*—all these contribute to the popularity of Amatite.

We can make Amatite better and cheaper than anyone else on account of our greater facilities, and consequently we sell it at a surprisingly low figure.

Simply the fact that it *needs no painting* is enough to make a man sit up and take notice—especially the man who has spent dollars and days in painting and repainting his smooth surfaced roofings.

Write today for free sample and booklet to nearest office.

Barrett Manufacturing Co.

New York, Chicago, Philadelphia, Boston, Cincinnati,
Minneapolis, Cleveland, Pittsburgh, New Orleans,
Kansas City, St. Louis, Seattle,
London, Eng.

6 Months Free Trial

Try this grinding, buffing and polishing outfit for 6 months Free and prove how it helps tool users, shops, factories and contractors save and earn more money. Keep it a whole half year free, then if you can afford to be without it, send it back.

LUTHER DIAMOND TOOL GRINDERS

Carborundum peels off hardest steel in tiny shavings. No heavy pressing necessary—no need of cooling with water. Wheels do not glaze or get lopsided. Guaranteed five years—Grinder is built like a high grade lathe, steel and malleable construction, dust-proof bronze bearing, machine cut spur gears, machine parts in oil bath—2500 revolutions per minute.

11 Tools in One, consisting of Mechanics' Special Grinder and attachments as follows: Rough Carborundum wheel, fine Carborundum wheel, chisel grinding attachment, twist drill attachment, polishing spindle, buffer, polisher, oil stone, Carborundum hone in leather case, Carborundum scythe stone, foot power attachment.

**Write
Today
for Six
Months'
Free Trial Offer,**

and Free Booklet reprinting from McClure's Magazine the wonderful story of Carborundum.

LUTHER GRINDER MFG. CO.
68 B. MADISON ST., MILWAUKEE, WIS.



Will not draw temper from steel, 25 times faster than grindstones—6 times faster than emery wheels. Hand and foot power.

THE TYPEWRITER ALPHABET.—An ingenious correspondent of the New York Sun suggests that the alphabet be taught to all children in this order:

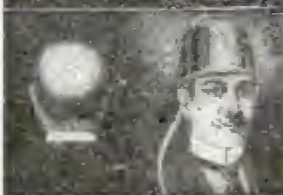
q w e r t y u i o p
a s d f g h j k l
z x c v b n m

which is the "universal" one, as can be verified by a glance at any typewriter keyboard. He goes on to say: "If the alphabet were so arranged and universally taught, instead of in the arbitrary and useless though historical order, then the literally millions all over the world who are learning to operate, professionally or otherwise, the typewriter, would have their path smoothed for them and be able to get up speed from the start." In this typewriter age, why wouldn't it be common sense to teach the children their Q W E's, instead of their A B C's?



Fish Bite like hungry wolves and keep you busy pulling them out whenever you use our **Wonderful Fish-Luring Bait.** See a box. Write for free booklet and our special offer of one box to help introduce it. Walton Supply Co., Dept 20, St. Louis, Mo

NO MORE BALD HEADS



When our VACUUM CAP is used a few minutes daily. We accept no pay until you have tried the Cap 60 days and are satisfied. The Vacuum Cap is an appliance that draws the blood to the Hair Roots and starts a new healthy crop of hair. It stops banding, stops the hair from falling out. Bought by Doctors and men who

know that it is the only reasonable HAIR GROWER known to science. No Drugs Used. Write for application blank, testimonials, and booklet on "HAIR" sent sealed in plain envelope, FREE.

THE MODERN VACUUM CAP CO.

Q. 559 BARCLAY, DENVER, COLO.

6 Important Books For Electrical Men



Bound in Half Morocco,
3,500 Pages,
1900 Illustrations,
Page Plates,
Etc.

We Want You to Examine These Books FREE OF CHARGE

They are just what you want if interested in any branch of electrical engineering. We want you to examine the complete set at our expense.

This Great Cyclopedia of **Applied Electricity**

is written by thirty expert electrical engineers—the biggest men in the profession. It is especially designed as a working guide for the student and ready reference for the expert. *Their reference value is guaranteed* because they are compiled from the regular text books used in the correspondence courses of the American School of Correspondence.

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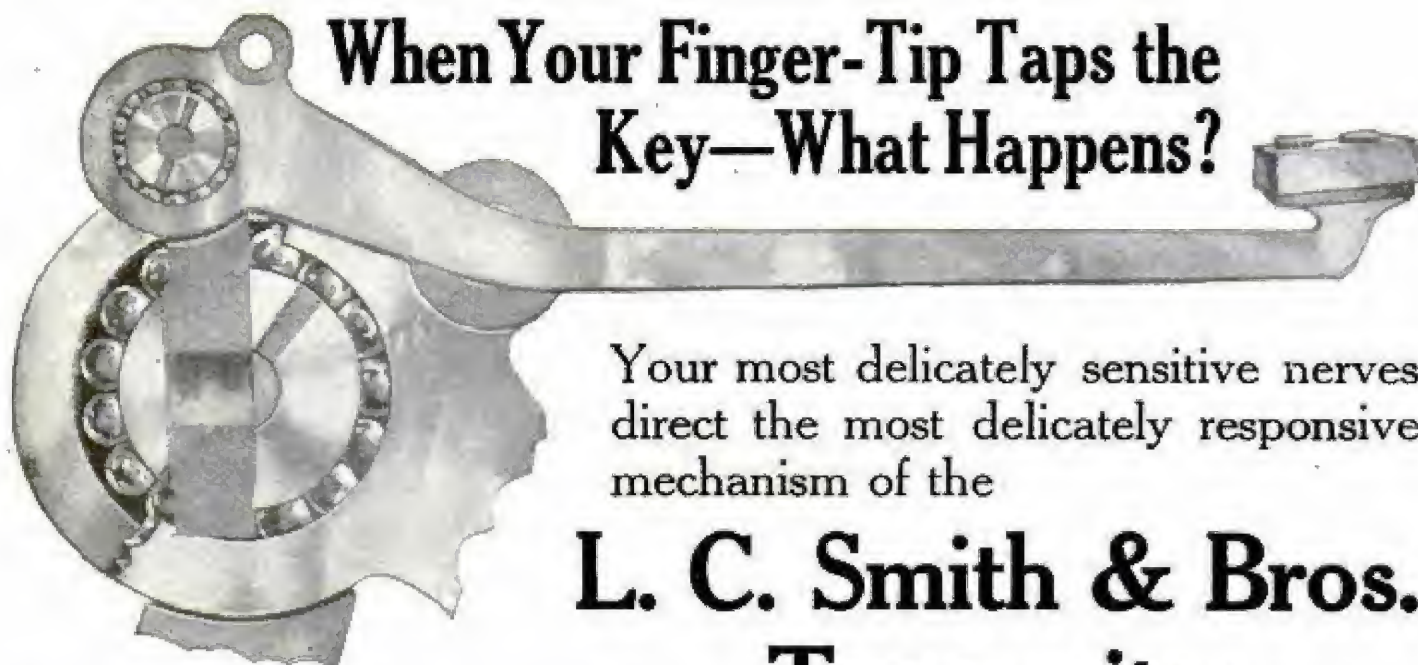
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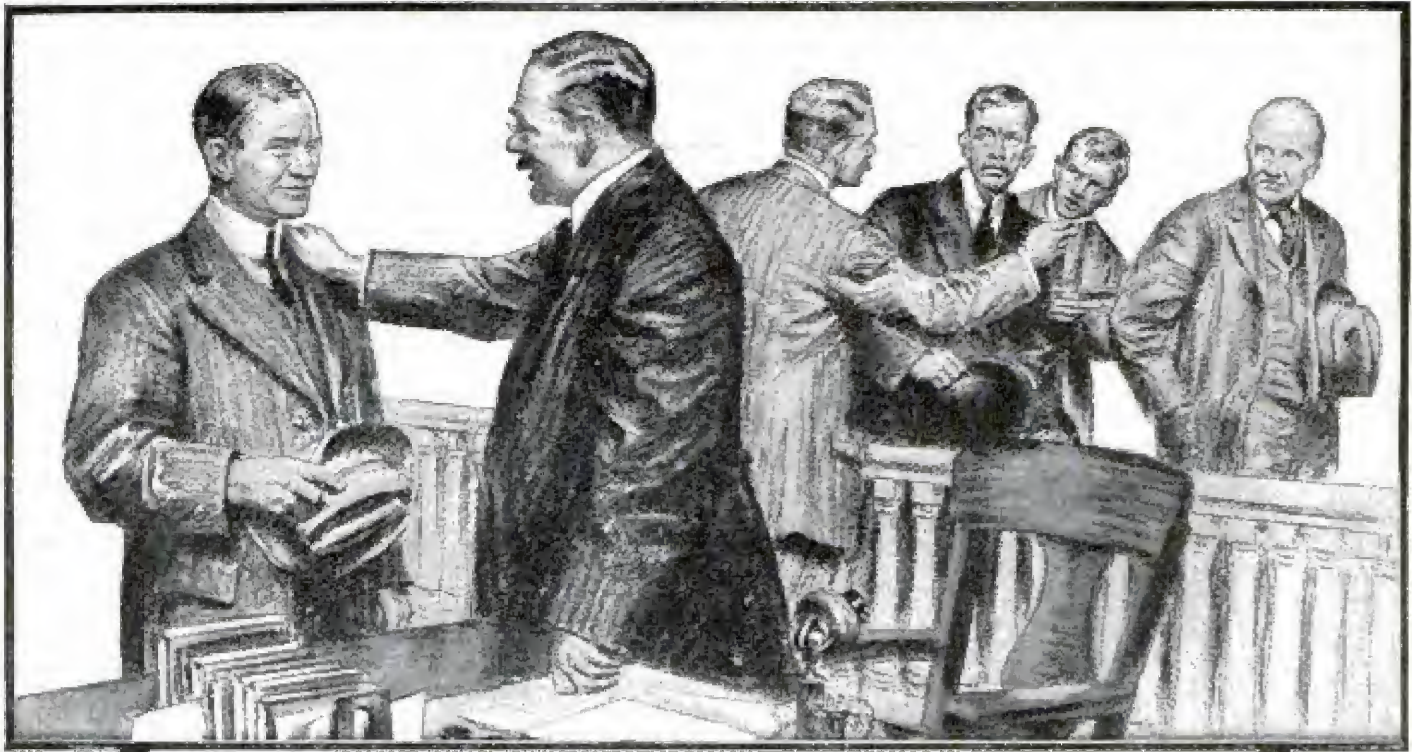


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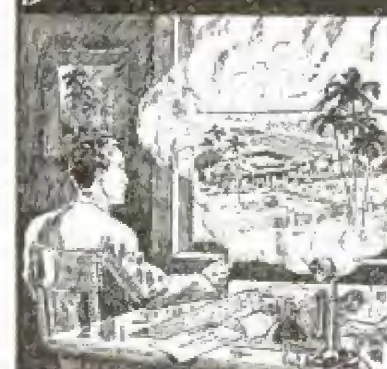
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


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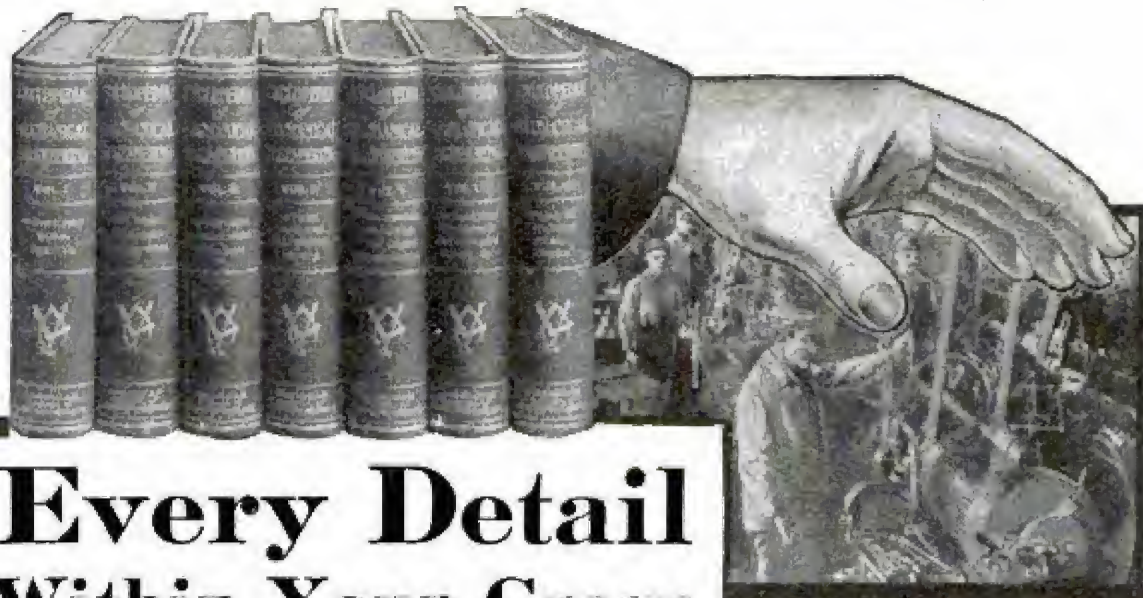
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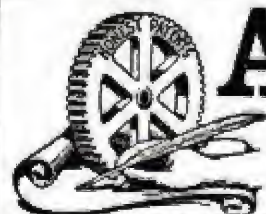
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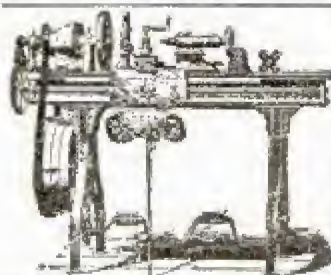
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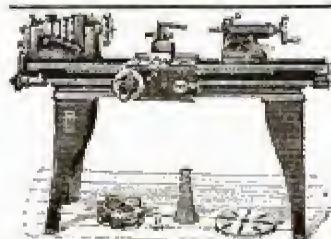


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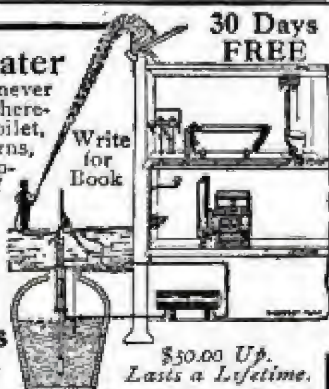
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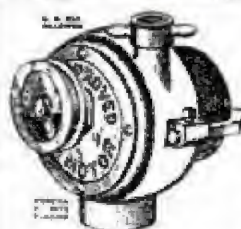


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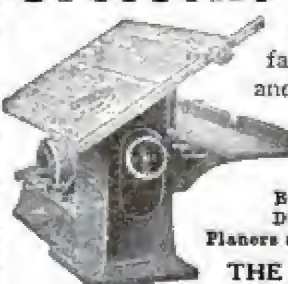


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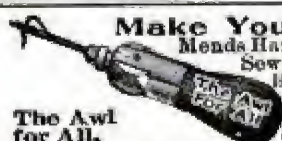


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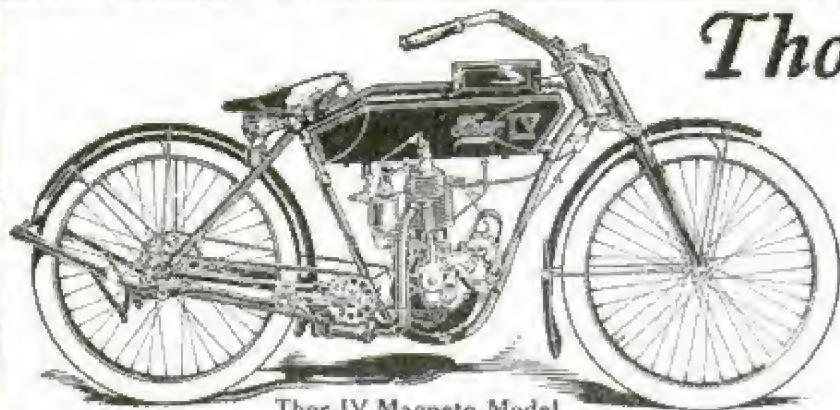
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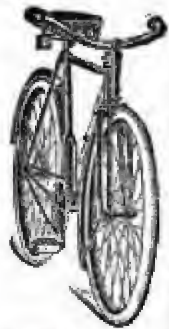
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IT'S ALL IN THE CRANK HANGER

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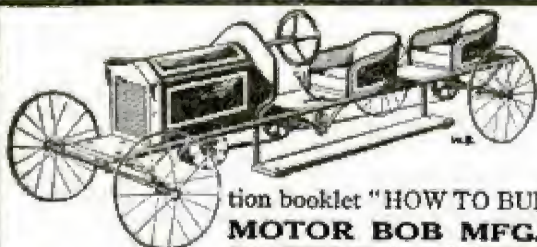
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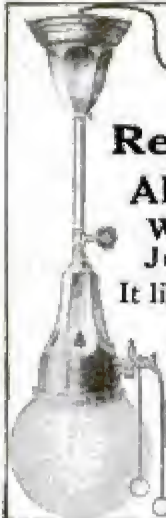
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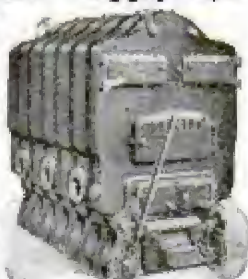
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party, insisted on placing the skeleton on a music-stool and guiding the bones of the fingers over the keys of the piano.

Not long after Chopin called on M. Ziem, to seek respite after an appalling night passed in a struggle with ghosts that sought to entice him to the underworld. The recital of his nightmares recalled to M. Ziem the piano performance by the skeleton and the Prince de Polignac.

Chopin shuddered; then he asked, "Have you a skel-



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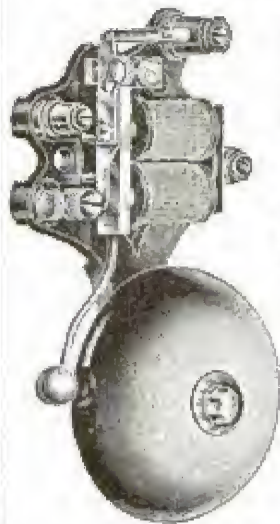
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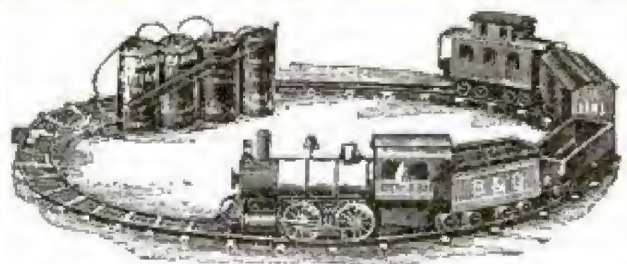
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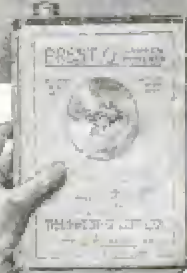
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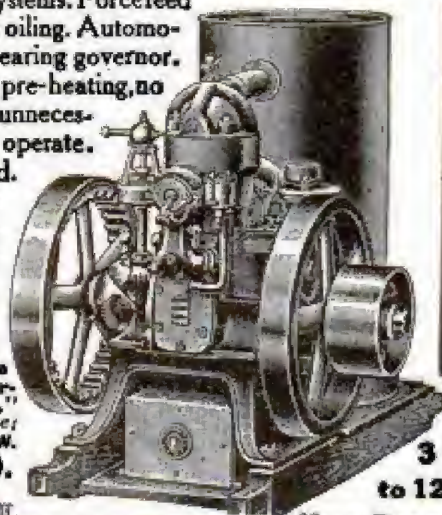
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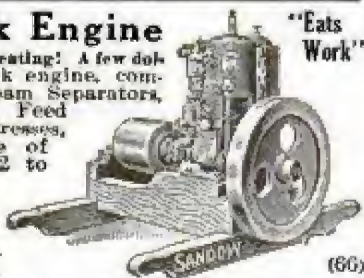
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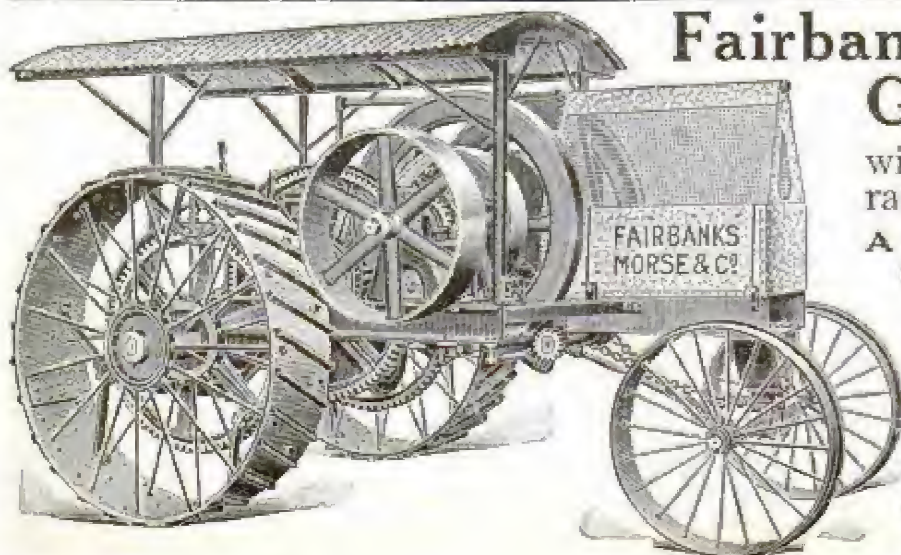
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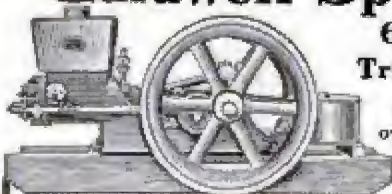


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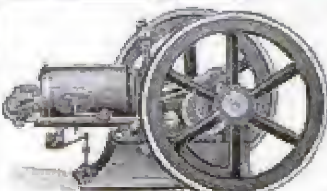


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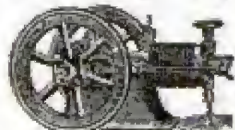
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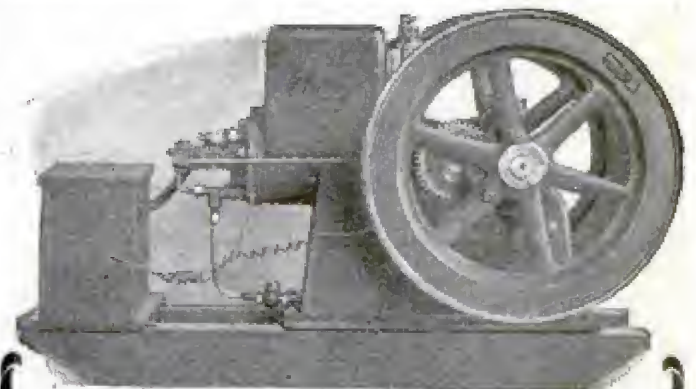
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YOU should not even consider engines that operate on gasoline only. The rapidly rising price of gasoline, now 6 to 16 cents higher than kerosene, absolutely makes operation on this fuel too expensive. The Perfection Kerosene Engine operates on any engine fuel. When you purchase it you are on the safe side—proof against all fluctuations of the market. You can always run this engine at a great fuel saving and get the greatest amount of work done. The Perfection vaporizes its own kerosene and so makes it as efficient as gasoline—something other engines cannot do.

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CAILLE PERFECTION MOTOR CO.

205 Second Ave.

DETROIT, MICH.

SCENTED TOBACCO.—It would be better, says the London Lancet, in discussing the question of salts in tobacco, if the tobacco manufacturer kept no account with the dry salter and chemist.

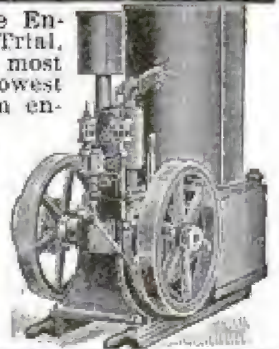
"It is pretty certain that if the real demand of the smoker is in favor of a highly-scented tobacco, it matters very little what the quality of the tobacco is. To him tobacco merely serves the role of a smouldering vehicle, his choice of a brand being based upon a scent

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Amazing "DETROIT" Kerosene Engine shipped on 15 days' **FREE Trial**, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing.

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Automobile owners are burning up so much gasoline that the world's supply is running short. Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline. No waste, no evaporation, no explosion from coal oil.



Amazing "DETROIT"

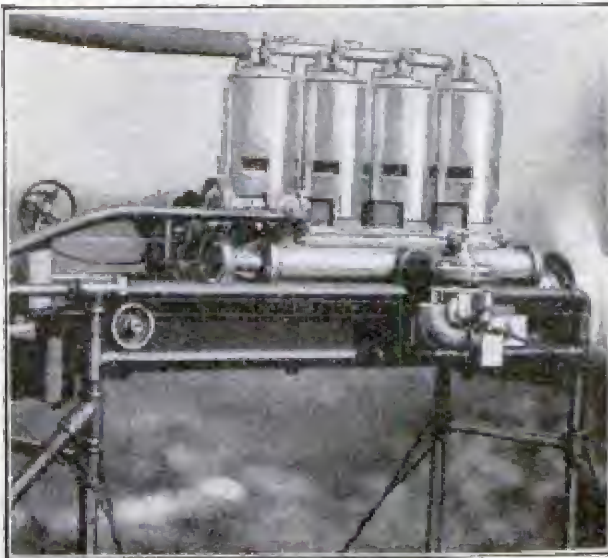
The "DETROIT" is the **only** engine that handles coal oil successfully: uses alcohol, gasoline and benzine, too. Starts without cranking. Basic patent—only three moving parts—no cams—no sprockets—no gears—no valves—the utmost in simplicity, power and strength. Mounted on skids. All sizes, 2 to 20 h.p., in stock ready to ship. Complete engine tested just before crating. Comes all ready to run. Pumps, mows, threshes, churns, separates milk, grinds feed, shells corn, runs home electric-lighting plant. **Prices (shipped), \$29.50 up.**

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AEROPLANE MOTORS THAT STAND THE TEST



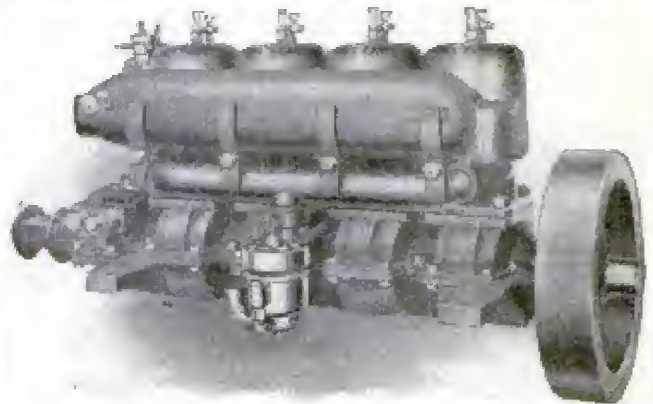
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which is foreign and artificial. Depraved taste may be traced to the action of the trade in the first instance, and to the meek and weak attitude of its patrons.

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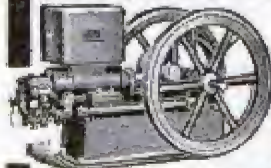
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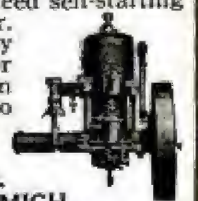


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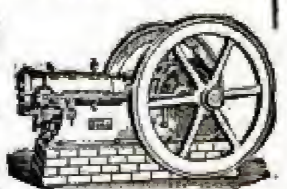
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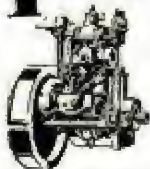
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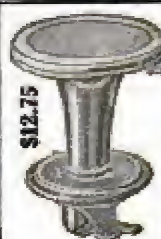
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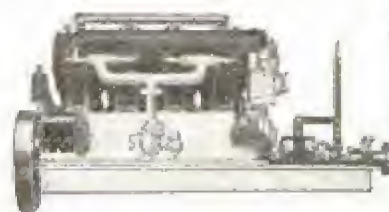
¶ We all get it—the “speed bug”—at one time or another; there's a certain fascination in matching boat against boat, engine against engine, and skill against skill.

¶ And when you see that you are going ahead inch by inch, and finally show a clean pair of heels to the entire “bunch,” you wouldn't trade places with a king on his throne.

¶ An engine that is built right—like the Scripps—needs little handling. It has the smooth, unerring precision of stroke that is characteristic of the highest type of automobile engine. It responds to your slightest wish, and puts forth all its power with apparently no effort, no straining or racking of its parts.

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¶ If you will send for our New 1911 book and read it; if you will go to the nearest Scripps dealer and look at the engine yourself, you will understand why so many experienced motor boat owners “swear by” the Scripps.



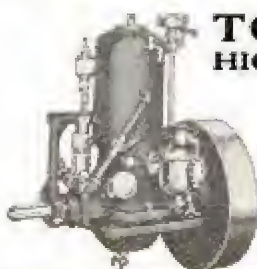
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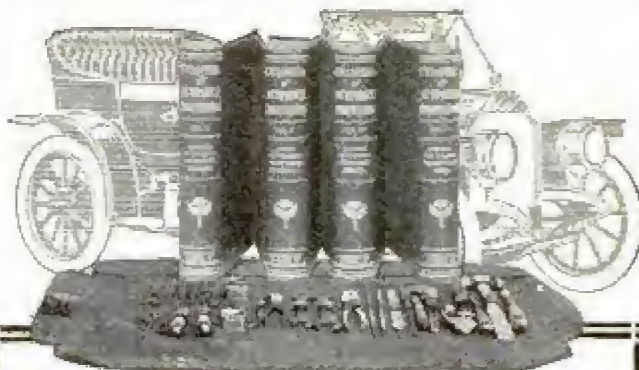
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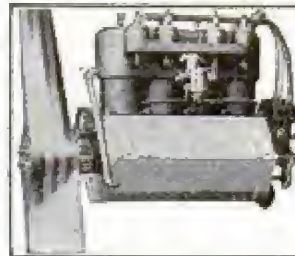
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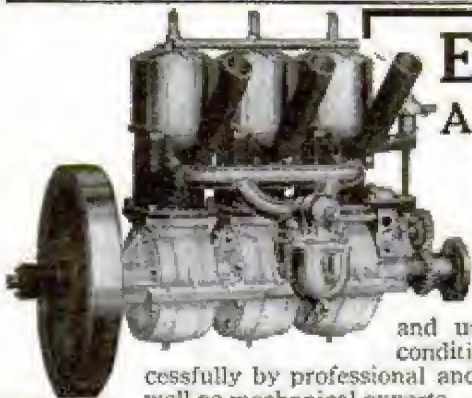
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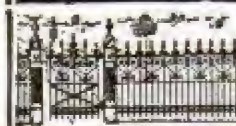
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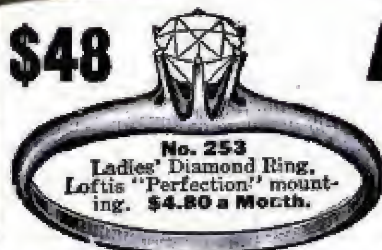
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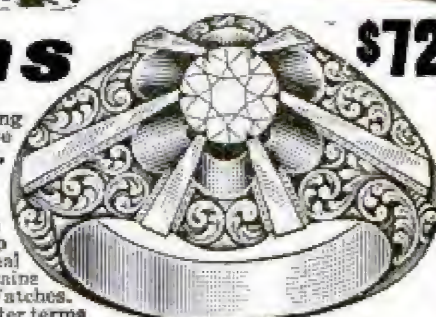
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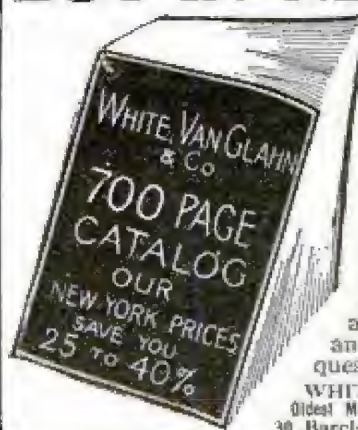
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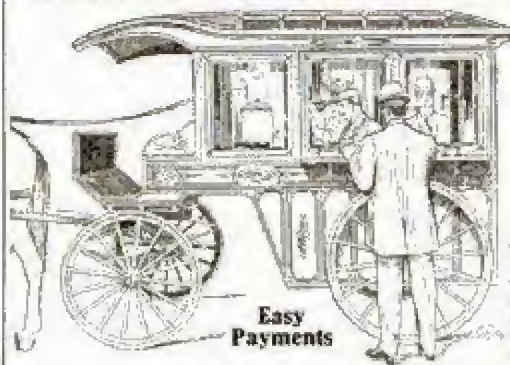
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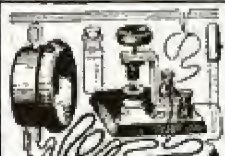
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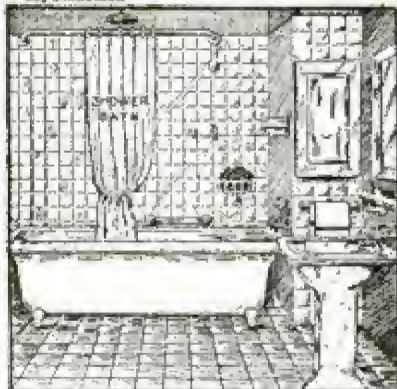
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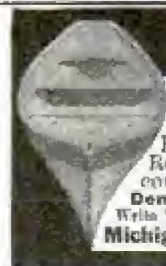
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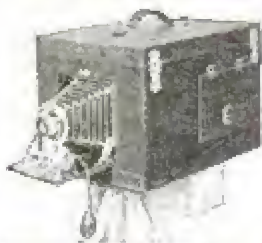
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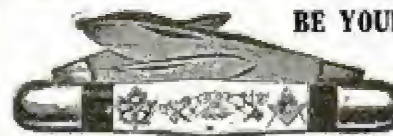
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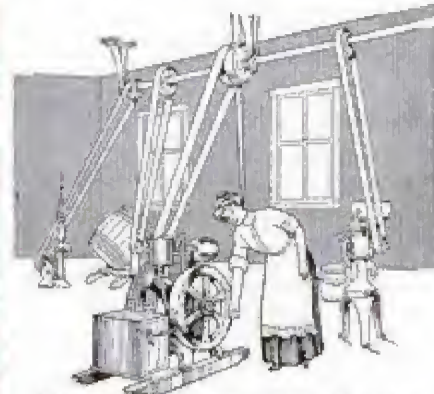
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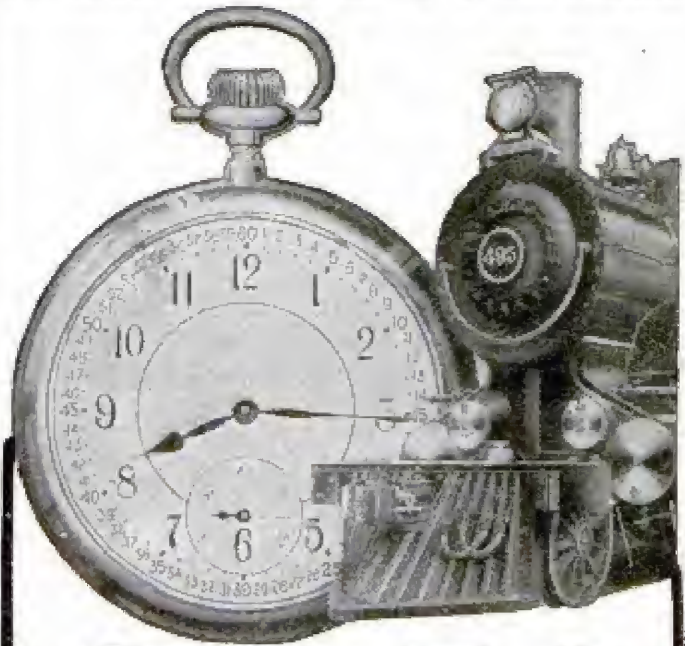
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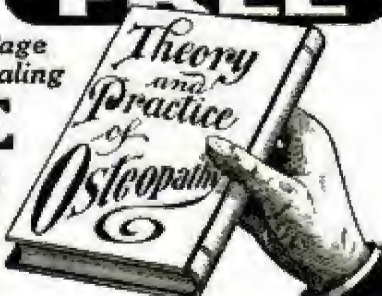
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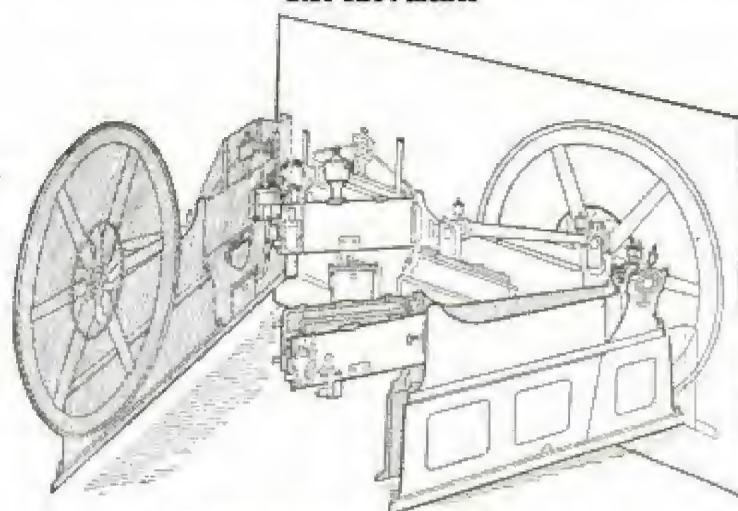
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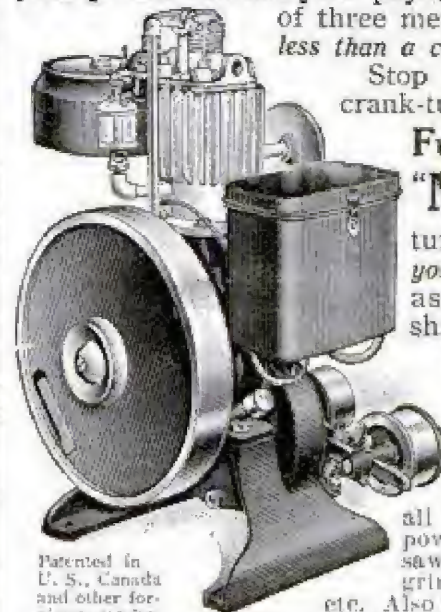


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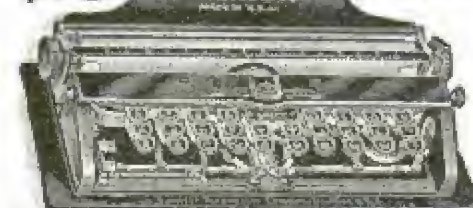
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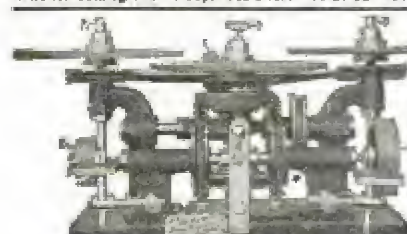
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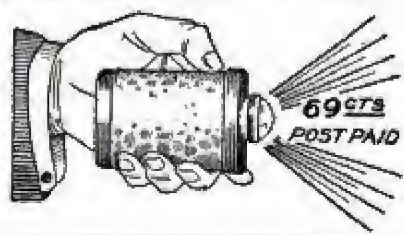
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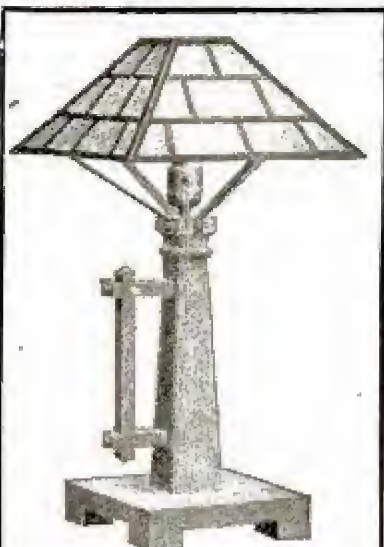
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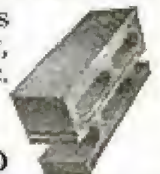
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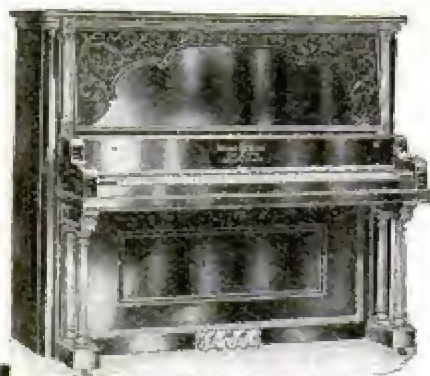
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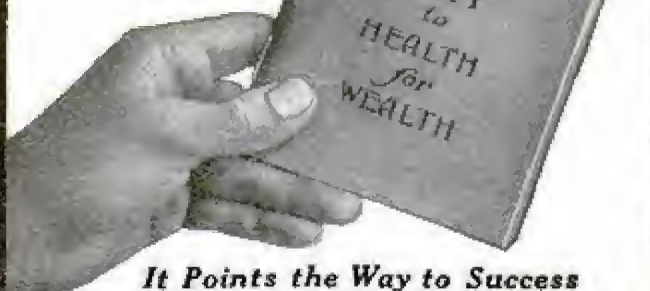
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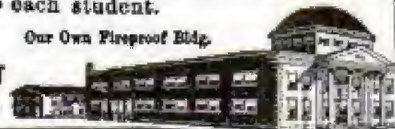
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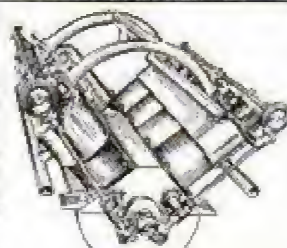
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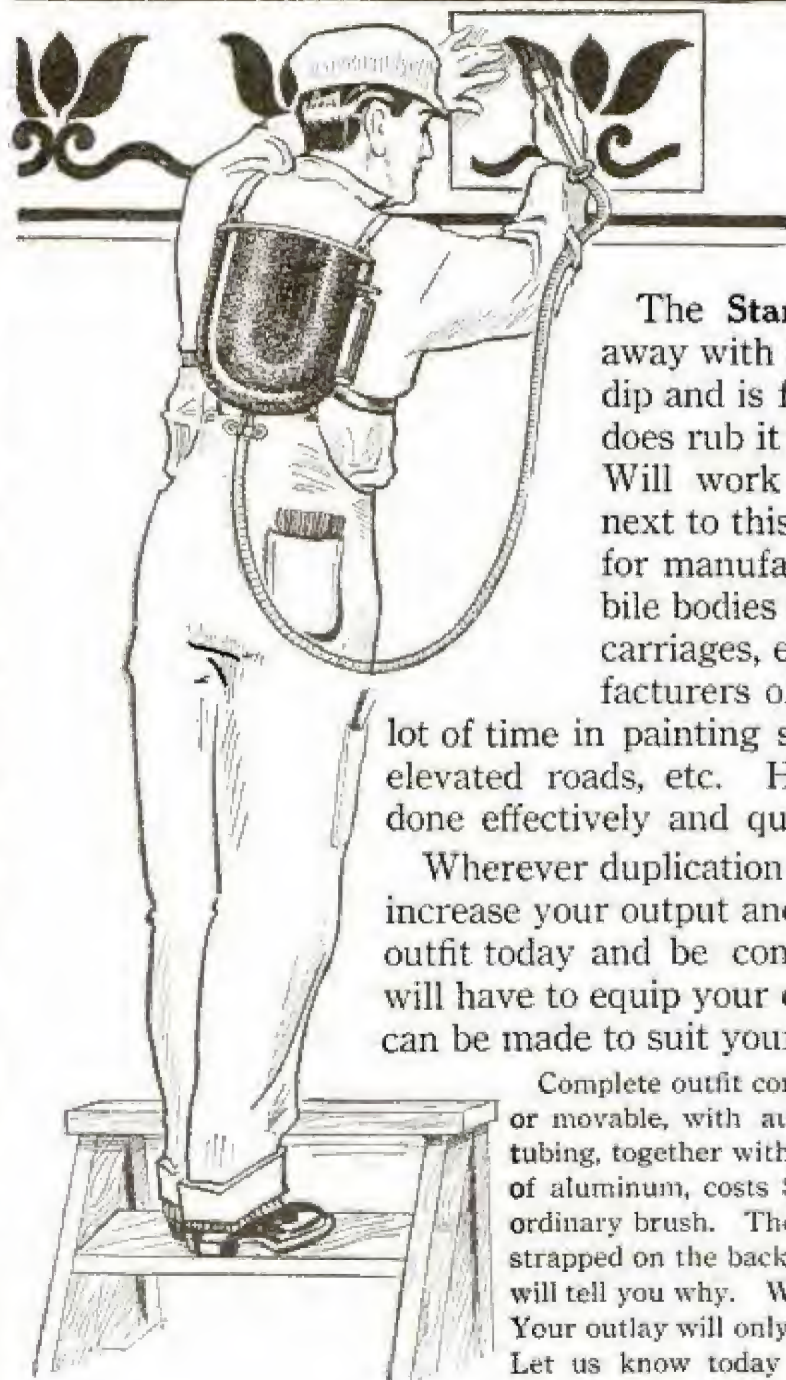
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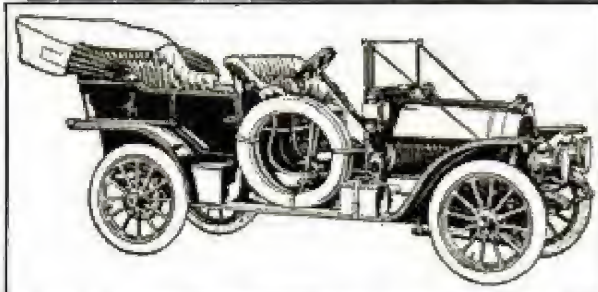
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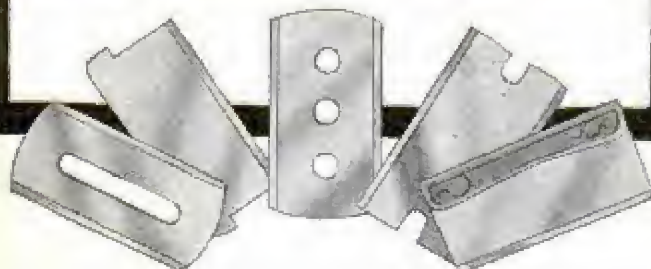
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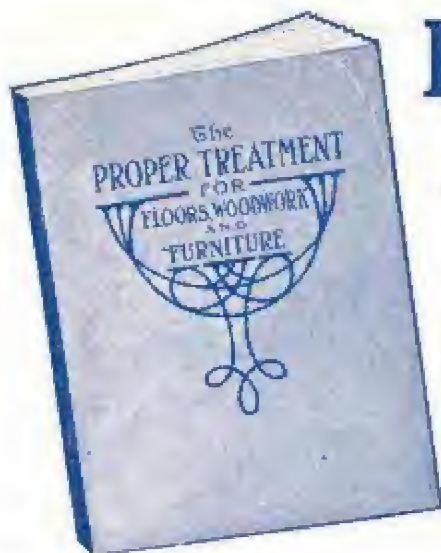
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